# Ingenieursbureau Stendess N.V.

Contact Jurn De Vleeschauwer, Wim Dewilde
Address Grote Baan 18
9920 Lovendegem, Belgium

Phone +32 9 370 71 25
Email mail@stendess.com
Website www.stendess.com

Ingenieursbureau Stendess N.V., a steel and concrete engineering company

The engineering firm Stendess was founded by an experienced team specialising in the study and design of steel constructions. From its establishment Stendess has made high quality and full service provision its top priority. Thanks to this integral service, where the design of the metal superstructure and the concrete substructure are calculated and drawn by experts in the same office, the building owner and principal contractor retain 100 % control over the complete structure.

Stendess can follow up on cross-border projects in accordance with most standards and codes: Eurocode, NBN, NEN, DIN, NF, AISC, British Standards and specific national codes.

**Key activities**

- Industrial buildings: steel factories, power plants, depots, etc,
- Other buildings: service buildings, concert halls, sport facilities, swimming pools, apartment buildings,
- Bridge constructions: arch bridges, cable –stayed bridges, suspension bridges, bascule bridges, swing bridges, orthotropic bridges, mixed steel-concrete bridges…
- Off-shore projects: lock gates, Roro, oil rigs…
- Industrial equipment: silos, cranes, crane ways, storage tanks…
- Erection engineering: longitudinal and transverse repositioning, skidding, lifting, bridge launching…

Locations of the constructions: Belgium, the Netherlands, France, Germany, United Kingdom, Spain, Sweden, Saudi Arabia, Greece, Singapore, Chile, Brazil, Cameroun, Russia, Thailand…

## Short Description

### *Bicyclist and pedestrian bridge, Beernem*

*The bridge of this project is build to cross the canal Ghent-Ostend in an easy and safe way. It connects the station district of Beernem with the centre of the village.*
*This bridge is also a real surplus value, a touristic trump for the yacht-basin of the town.*
*The bridge is a cable stayed bridge with a mixed concrete-steel deck. The deck consists of a concrete slab which is supported by 4 longitudinal beams. These longitudinal beams have a common lower flange which is curved. The pylon is an A-shaped pylon. The legs of the pylon have an elliptical cross section of which the dimensions are variable along the height of the pylon.*

## Project Information

Owner: Beernem
Architect: AMS
General Contractor: Van Britsom & Verheye
**Engineering Office**: Ingenieursbureau Stendess N.V.

Construction Start: 2008
Construction End: 2008
Location: Beernem, Belgium

- Type: cable stayed concrete-steel bridge
- Location: Beernem, Belgium
- Total Steel weight: +/- 215 tons
- Total length: 98 m width: 4,5 m

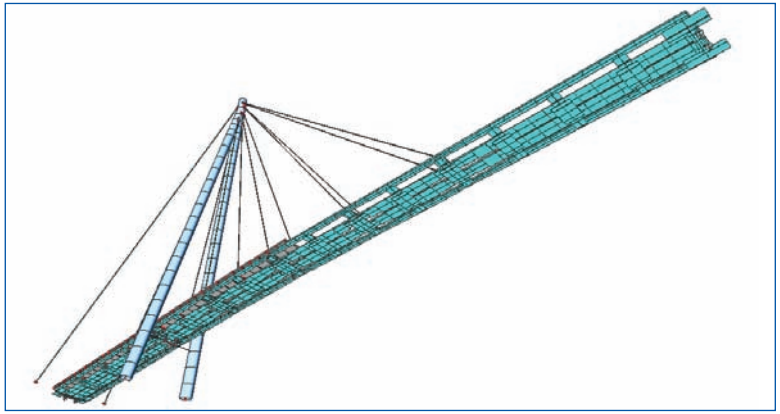
The bicyclist and pedestrian bridge of Beernem is build to cross the canal Ghent-Ostend between Vaart-North and the Stationsstreet in an easy and safe way. It connects the station district with the centre of the village. The bridge is also a surplus value for the yacht-basin of Beernem. This connection is a touristic trump to expand the yacht.
The bridge can be described as a cable stayed bridge with a mixed concrete-steel deck. The deck consists of a concrete slab which is supported by 4 longitudinal beams. These longitudinal beams have a common lower flange which is curved. The pylon is an A-shaped pylon. The legs of the pylon have an elliptical cross section of which the dimensions are variable along the height of the pylon.

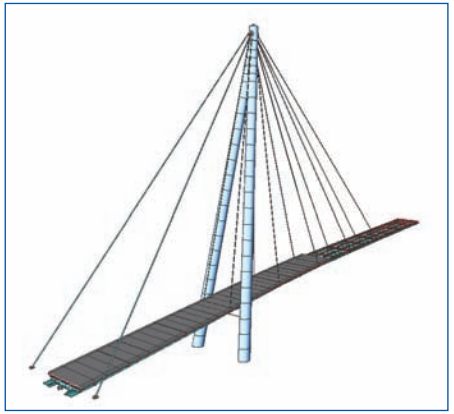
## Use of ESA-Prima Win

### Description of technical questions to be solved with ESA-Prima Win

Both, for the dimensioning of the bridge in the traffic situation and the erection engineering of the bridge, ESA-Prima Win was used.

From point of view engineering this project has several challenges.
First, there was the fact that the bridge deck was mixed concrete-steel. This implied a deck calculation in several stages with different stiffness factors and





Used software: ESA-Prima Win

the calculation of cracked-uncracked concrete.
The possibility of calculating mixed section and of the use of graphical section by ESA-Prima Win was a big advantage.
Second, there was the limitation of the reactions on the bridge end supports. Also here ESA-Prima Win proved its possibilities.
Third, there was the simulation of the realistic behaviour of the cables. The cables were simulated as classic bars, but with the E-modules of the tension bar material in relation to the inclination of the tension bars (this means they were considered as cables with a fictive E-modulus). Because the linear calculations resulted in compression in the tension bars a non linear calculation was needed.
Fourth, there was a second order calculation needed for the check of asymmetrical pylon based on a stability calculation.
Fifth, for the erection engineering the different construction stages had to be examined and a severe erection and pretensioning manual for the mounting of the cables was needed. This to achieve the theoretical form of the bridge deck.
Sixth, the dynamic behaviour of the bridge was to be checked.

### Description of how our experience with ESA-Prima Win proved its completeness

- Dimensioning a 3D structure consisting of different materials (steel, concrete).
- The possibility of using and combining the results of ESA-Prima Win in a flexible way.
- The possibility of calculating mixed concrete-steel sections.
- The possibility of calculating graphical sections.
- The possibility of using tension only elements for the modelling of the cables.
- Stability calculation and second order calculations.
- Checking the dynamic behaviour of the structure by calculating the eigenvalues of the structure.

This project proves the great diversity of ESA-Prima Win in checking the structure and the use of materials.

### Used modules

- Base
- 3D frame
- Dynamics
- Steel code check (NEN)
- Stability
- Physical non linear conditions