Witteveen+Bos / TCE

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Witteveen+Bos and DE-Consult: together TCE. Two independent engineering companies have joined forces for railway infrastructure project under the name Transport Consultants and Engineers (TCE).

Witteveen+Bos is leading in the Netherlands in the areas infrastructure, water, construction and the environment and as a Dutch company understands the particular characteristics of the Dutch country. The German DE-Consult is best known as a specialist in railway infrastructure, with extensive international expertise in the areas of track design and railway operation. TCE is recognized by ProRail and is authorized to carry out track related design work for track and above ground structures, safety, traction and power facilities (overhead wires) and concrete and steel constructions.

TCE offers a complete railway infrastructure service package for integral projects. Our specialist, with their experience, technical know-how and expertise, are capable of the professional management of a complex railway infrastructure project from the first concept to the commissioning of the system.

Complete package of services

With is expertise and years of experience in the development of rail, tram, metro and regional transport and its knowledge of local town and district transport, TCE is capable of developing a tailor-made transport system for any client.

Project teams

TCE´s project teams involve closely cooperating specialists in various rail-oriented, disciplines, reinforced where necessary with other specialists from Witteveen+Bos and DE-consult. Our approach focuses on short lines of communication with the client, flexible working methods and open communication. Working in small teams makes us an attractive employer and provides plenty of opportunity for personal development. As a well willing cooperating company TCE has proved to be an outstanding partner for contractors to realize competitive projects.

High-profile projects

- The railway zone in Delft.
- The Heart of Dieren, where the existing railway line and secondary road running next to it were laid in a sunken trough and tunnel respectively.
- Extension of the railway track between Utrecht and Vleuten (VLARK). TCE worked as a designing partner for contractor Van Hattum & Blankevoort.
- Prior to the commissioning of the IJzeren Rijn (Iron Rhine), TCE handled the route memorandum / the environmental impact assessment and the preparation of the finalised route plan.

Short Description

Railway Underpass Klinker Hoogezand-Sappemeer

The project regards an underpass of a width of 20 metres, giving place to a road track, a bicycle track and a pavement. The railway underpass was constructed to open up the newly built quarter Vosholen and to create a non-conflicting crossing. The tunnel consists of a hundred meters long ramp with a viaduct for an overhead road and a railway viaduct for two rail tracks. In short, for this project Allplan Engineering again proved his benefits. With almost the same effort as with 2D designing we created clear, intelligent and faultless communication documents. These visualizations, drawings, list of amounts and bending schedules have also lead to the success of the whole project.

Project Information

Owner: ProRail / Gemeente Hoogezand-Sappemeer
Architect: Gemeente Hoogezand-Sappemeer
General Contractor: BAM Civiel Noordoost
Engineering Office: TCE

Construction Start: 01/09/2007
Construction End: 01/11/2008
Location: Hoogezand-Sappemeer, Netherlands

Figures

- Concrete: 1750 m^3
- Reinforcement: 240.000 kg
- Weight of the railway viaduct (which has been shifted): 740.000 kg

Introduction

To open up the newly built quarter Vosholen and to create a non-conflicting crossing, the local authority of Hoogezand-Sappemeer has decided to construct a railway underpass. The project has been put in the market by a Design&Construct contract and has been acquired in February 2007 by contractor BAM Civiel Noordoost. The contractor asked TCE to design the railway underpass. The tunnel consists of a hundred meters long ramp with a viaduct for an overhead road and a railway viaduct for two rail tracks. The railway traffic has been taken out of service for a weekend to shift the railway viaduct into the final position. In October 2008 the underpass has been opened.

BAM Civiel Noordoost

Construction

Railway viaduct

The railway viaduct consists of a concrete construction with a foundation of round steel piles filled with concrete (tubex). The rails have been glued into the special gutters, which have been made into the concrete deck. By choosing for the principle of lining the rails, instead of the standard construction with a base of ballast, the total construction height is reduced to a minimum. Reverse aspect of this solution is the need for a special transfer construction between the relatively flexible rail track on the ballast bed, before and after the railway viaduct, and the rigid construction on the bridge. Through double transfer slabs a reliable and safe construction has been created.

Underpass

The width of the underpass is about 20 metres and gives place to a road track, bicycle track and a pavement. The foundation of the construction consists of precast concrete piles. Concrete walls provided with a longitudinal bar create the vertical ground shoring at the entrance ramps. This longitudinal bar forms a whole with the bars on the sheet pile walls downstream at the deep underpass segment. A gabion construction at the west side and a grass slope at the east side create an underpass with natural image.

Used software: Allplan Engineering, Scia Engineer, MSeries

Railway Underpass Klinker Hoogezand-Sappemeer

Designing with Allplan Engineering

Yet in the first tender stadium the designers of TCE used the force of the Allplan software. To make a valid proposition the initiator required a visualisation of the underpass. In a short time the underpass has been designed for a visualisation. Not only the rendered product turned out to be very valuable, even the simplified model has been clarified a lot of difficult details. So some risks are reduced in an early stadium.
Like in previous projects has been expired, 3D designing creates a lot of benefits in several stages and for various users: from initiative to build phase, for politicians and bar benders.

3D designing decreases the distance between design and construction. An important benefit of a Design&Construct contract is the one to one relationship with the contractor. Arrangements for form and reinforcement solutions were made before starting the detail phase, like the segmentation of curves, bar lengths and forms. First of all difficult corners were made obvious and after that submitted to the contractor. Together we created a sober and effective solution. The drawings for the concrete formwork are provided with an isometric view, which results in a drawing that is more 'alive'.

No contractor wants irritating surprises at any moment, but certainly not in an out of service period. Before this period the contractor has to make a very accurate planning and he has to correspond this with the initiator. Unfortunately, design failures cause a lot of stagnation and irritation on the building scene. To reduce the risk of derailment the tolerances for gluing the rails into the concrete are very small. Reasons enough to design with care and choose for 3D engineering software. The 3D model was also sent to the shifting-contractor Freyssinet. To calculate the amount of concrete and thus the weight of the construction is just one press on the button.

TCE has used the Allplan software to design the reinforcement. Complex forms were made clear to anybody with a 3D visualisation and amounts can be easily showed and put in lists. For this project we did not use a direct controllable connecting with the bending machine, because it was not recorded in the contract. Anyway, the bending schedule on the drawing did create a lot of benefits. It was used as a control document, it is easier to compare different proposals (filter at diameter, bending shape, etc...) and the waiting time at the bending factories reduces, because the bending schedule is already present.

There are less negative experiences with 3D designing. Habituation is the most important one; the step from 2D to 3D thinking can be experienced as difficult, but it is even a very exciting step. Another disadvantage is the time that takes to complete the first drawing, which often is a very important milestone. But, as soon as the 3D model has been finished, drawings can be extracted easily and very fast. An enormous benefit is that the cross sections and the views match and that they are intelligent among themselves.

In short, for this project Allplan Engineering again proved his benefits. With almost the same effort as with 2D designing we create clear, intelligent and faultless communication documents. These visualizations, drawings, list of amounts and bending schedules have also lead to the success of the whole project.