

World's largest spatial framework realised with RSTAB 6

Design of a roof-structure of about 195,000 m² with Dlubal statics software

On Al Yas Island, the biggest natural island of the Emirates, the **Ferrari World Theme Park** is presently erected as an amusement and leisure facility. It will contain, according to the design concept of Benoy, in addition to a Formula 1 fitted circuit, a shopping mall of the size of 300,000 m², condominiums, marinas as well as several luxury hotels and two golf courses. The park is built in two phases – phase 1 will presumably be completed in 2009, whereas the second phase shall not be implemented until 2014.

The Ferrari World Theme Park is covered by a vast roof. The entire roof structure with a surface of about 195,000 m² consists of a MERO spatial framework. With a total number of about 170,000 bars and about 42,200 joints, it is the largest spatial framework ever built.



3D-Visualisation of the Ferrari World Theme Parks (Benoy Architects)

For the modelling, the entire structure was separated into three sub-structures: The inner core, the main structure and the three outer "pincers".

The core consists of a truss structure with 4,025 joints and 13,346 bars. For statical calculations, 15 load cases, 89 load groups and 2 load combinations were created. With its overall dimension of 353 x 350 x 43 meters, the main structure is the largest and most demanding part of the structure. 21,433 joints and 87,102 bars represent the structure. Steel pipes of steel quality S 355 are used as cross-sections. The maximum cross-section diameter of the steel columns is 1016 mm.

During the modelling of the three identical "pincers", it was possible to confine the analysis to one of the three structures. Thus, a relatively clearly arranged calculation model made of 5,687 joints and 22,828 bars developed. 26 load cases, 74 load groups and 2 load combinations represent the concept for the structural design of the structure.

The calculation of a MERO spatial framework is carried out with the usual means of structural analysis for spatial frameworks with hinged joints. The design calculation of the joints and bars is defined by the MERO approval that is based on DIN 18800. Spatial frameworks are able to activate a biaxial load transfer, if supported appropriately. In comparison to a planar structure, the deformation and forces within the cross-sections are reduced considerably, thereby providing a light and thus economical system.

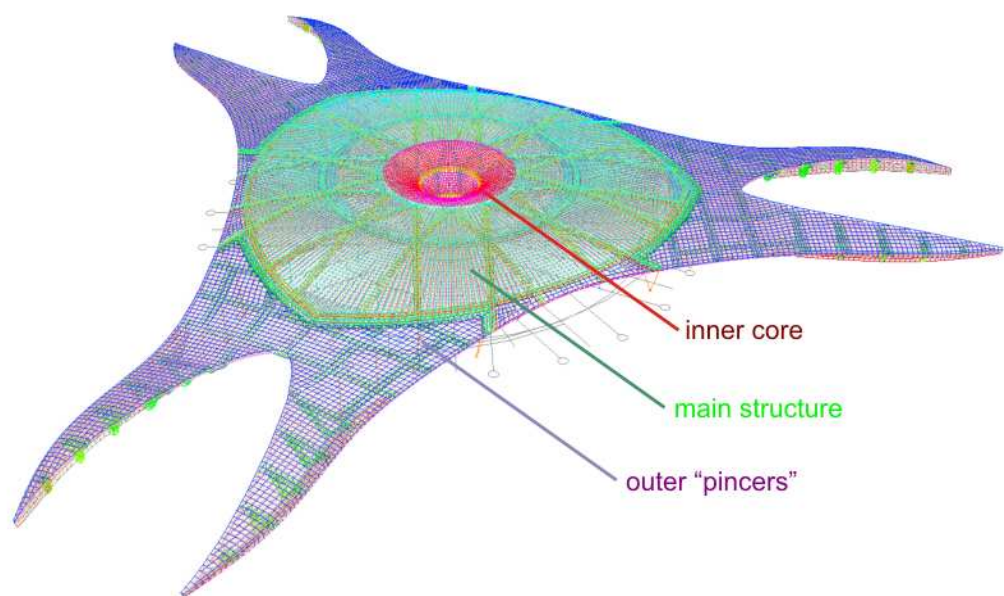
Mero-TSK has focussed on RSTAB as the framework programme for years. The Ferrari World Theme Park has been designed with the current version RSTAB 6, for only with this version the very large amount of bars could be handled.

Mero-TSK used specially developed preprocessors for the creation of the geometry and generated the model via DXF files and the RS-COM interface into the Dlubal framework programme.

RSTAB 6 includes a broad variety of interfaces. With their help, the CAD originals of other applications can be imported. Similarly the results of the statical calculations can be exported, in design or calculation programmes, too. Here, the use of data exchange with MS Excel is very common. The open architecture of RSTAB 6 allows to integrate the static software into the design process efficiently.

The size of the model constituted a particular challenge during this project. Due to the excellent cooperation between Ing.-Software Dlubal GmbH and the staff of Mero-TSK, singular difficulties which would have been irrelevant with a regular amount of bars could be solved fast and individually. The erection of the roof structure started at the beginning of 2008.

Ing.-Software Dlubal GmbH
Am Zellweg 2
93464 Tiefenbach
Tel: ++49 (0) 9673 9203 0
Fax: ++49 (0) 9673 1770
<http://www.dlubal.de>
info@dlubal.com



Truss structure in RSTAB 6