



Geometry and structural system

- Total steel weight: 25.2 t
- Height dimension: 6.4 m
- Overall length: 7.7 m
- Overall width: 7.5 m

Introduction

PHA company, situated in Prague, received an order to calculate the steel training module for Roof supports from the contractor Ostroj Inc. A Roof support is a hydraulic unit used in the mining industry. The steel training frame is designed for the presentation of units for inclined and steep seams extraction. The module is also intended for a miner training programme.

The newest types of the Roof supports are intended for the seams endangered by rock bursts. Therefore, the legs in the units are equipped with rock burst valves. Roof supports have a unit width of up to 2.05 m, with a hydraulic leg diameter of up to 400 mm that provide the load bearing capacity of up to 1,150 t and a section resistance of 140 kN/m².

The Roof support units are designed for shearer or plough Longwall systems. They are equipped with various types of bases, legs and control systems, and/or with accessories for inclined seams and for seams endangered by rock bursts.

Design software

The structural analysis was calculated using a 3D model in Scia Engineer software.

Design

The basic structural design was prepared in two models. The first model was with resistant forces supplied by Ostroj Inc. Company. The training frame was designed to bear resistant forces which show functionality and practical use of the Roof support machines.

The second model was designed according to Eurocode standards EC3 in the transverse and longitudinal directions, with stabilisation by bracing.

The Roof supports steel module is independent in regard to anchoring and is a self-bearing structure.

The minimum floor slab load bearing capacity of 10kN m² was required.

There were also requirements for a frame mount and demount according to the global container dimension and weight.

All connections required the demountable (bolted) type of joints. The structure can be mounted anywhere in the world within five days.

Load

Design loads conform to the contractor's requirement.

The point force from hydraulic cylinders is 203 kN x 2 in a line.

The training module is designed for interior exhibition without wind and snow loads.

Design process

The training module was calculate in the Scia Engineer program and exported to the Tekla program with Module Scia 2 Tekla. The designer used the perfect combination for the design and fabrication of steel constructions.

For a fast feedback, the designer used 3D export from Tekla to the browser. With this export the contractor took influence in his project.

Conclusion

Scia Engineer has been used for an unusual mechanical structure design. The designer used the advantage of programs for a cooperation between the contractor, designer and different software.

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Atelier P.H.A. was founded in 1990.

P.H.A. deals with design tasks, preparation and implementation of investment projects and engineering activities, and is an expert in the field of construction and real estate investments. P.H.A. participates in opinions carried out on structures after the 2002 flood, opinions on the condition and measures taken on load-bearing structures in industrial, high-rise apartment buildings and apartment building regeneration, opinions on the impact of emergency situations - like fires and flooding - on load-bearing structures, and in building passports during reconstruction etc.

PHA can follow up on international projects in accordance with most standard codes: Eurocode, Fema-350, UBC97, СНИП and other specific national codes. Structure designers participate in professional seminars, as well as structural engineering meetings and conferences, and lectures, and their contributions are published in professional newspapers.

Project information

Owner	Ostroj a.s.
General Contractor	Ostroj a.s.
Engineering Office	P.H.A. Atelier
Location	Opava, Czech Republic
Construction Period	09/2012 to 11/20112

Short description | Training Module for Roof Supports Ostroj

This project represents the steel training module (Roof supports) designed for the presentation of units used in inclined and steep seams extraction. The structure is composed of a steel frame with a combination of timber slabs. The timber slabs ensure the functionality of the Roof support and position, which only with friction resistance behaves inside inclined seams. The angle for the training module was set to 45° but in real seams the Roof support can work independently of the seam inclination. The customer was satisfied with the designer's work, and named the training module after the designer name, IDA.

