

Technical evolution of a convertible pool roof on three expedition cruise ships for the shipping company Hapag Lloyd

Alexander Hub^{*}, Alfred Rein[†]

^{*} Alfred Rein Ingenieure GmbH
Fuchseckstraße 7, 70188 Stuttgart, Germany
e-mail: mail@ar-ingenieure.com, web page: <http://ar-ingenieure.com>

[†] Alfred Rein Ingenieure GmbH
Fuchseckstraße 7, 70188 Stuttgart, Germany
e-mail: mail@ar-ingenieure.com, web page: <http://ar-ingenieure.com>

ABSTRACT

In 2016, Hapag Lloyd requested a flexible opening pool deck covering for three new cruise ships. Usually, this task is realized by a rigid steel-glass construction. Since the expedition cruise ships had to meet a very high requirement with regard to their draught, only a lightweight, textile roof was considered in this case.

As part of a preliminary study, a two-part ridge and valley cable construction that can be moved in parallel was chosen as the ideal solution. Each roof half has an area of 164m². A consortium of three companies, led by Textil Bau GmbH, developed the project, which had to be installed on three new ships within a year and a half. However, the timing of the project gave the unique opportunity to incorporate experience from the ongoing operation of the first ship into the optimized design of the subsequent roofs.

The technical concept of the roof is basically designed for robust operation under arctic as well as tropical conditions. In this respect, the partner responsible for the drive system was able to contribute its experience from crane and plant construction to the project. Only the ridge rope axes are motorized with the help of toothed belts, while the valley rope axes are driven in a controlled manner via a coupling. Due to the different requirements in terms of drive and load, two types of trolleys were designed. The design of the carriages is characterized by a layering of repeating components through which tolerances can be accommodated and adjustments made.

A total of three different membrane materials manufactured by two companies were used. Two roofs were made with sewn membrane material and one with welded membrane material. Two roofs were realized with ridge and valley ropes in steelmaking style and one roof with textile belts. Here, the modular design allowed for quick adjustment of details. The decisions made were significantly influenced by the experience gained in the production and operation of the roofs. This provided the planner with the basis for the technical evolution of the construction.