Ready for Schengen – New Construction and Renovation of Dock B at Zurich Airport

Matthias KUNZE
Civil Engineer
Dr. Lüchinger + Meyer Bauingenieure AG
Zurich, Switzerland
mku@luechingermeyer.ch

Matthias Kunze, was born in 1973 and received his civil engineering degree from the Brandenburg University of Technology Cottbus, Germany. He worked in the planning of load-bearing structures for various engineering offices in Cottbus and Berlin, Germany, before he began to work as a project manager for Dr. Lüchinger+Meyer Bauingenieure AG in Zurich, Switzerland. The main focus of his work is in the area of the preservation of load-bearing structures.

Summary

After a planning and construction period of only four years, the new Dock B at Zürich Airport was taken into service at the end of 2011. The building is 250 metres long and 48 metres wide and is crowned by a strikingly designed roof. It is an outstanding example of how existing structures can be treated responsibly and creatively in the planning process. Thorough prior examination showed that the existing steel structure had a load-carrying capacity which meets the new demands. This laid the groundwork for the decision to implement the new dock on the principle of "building within the existing fabric using the old structures". The load-bearing structure was enhanced and extended with simple structural elements. The flexibility of the old structure also allowed an uncomplicated implementation of openings for the new site access zones and spacious atriums.

Keywords: airport, terminal, survey, steel structure, preservation, alterations

1. Key project: conversion of Dock B

The resumption of the operation of the existing Dock B at Zurich Airport after the comprehensive alteration and extension work had the major goal of creating a terminal which is equipped with a Schengen level and a non-Schengen level and which will facilitate a very flexible use of the adjoining gates.

Fig. 1: Large building site for Dock B

At the same time, the creation of an attractive and informative visitor terrace aimed to revive a pleasant site and meeting point which is one of the main visitor destinations in Switzerland.

After the preliminary structural and architectural investigations had been carried out, the planners and the client decided at an early stage that the new building should be developed by adapting and extending the existing load-bearing structure.

The advantages in economy of resources, and savings of cost and time were set off against major challenges for the planners. Low ceilings, lack of daylight, lack of connections between the levels, pre-defined supply line conduits with limited heights and the limited load-bearing capacity of the old structure were just some of the problems which had to be solved. The location of the building site at the heart of the airport (Fig. 1), without any interruption in the operation of the surrounding airport, placed increased demands on the planning and execution of the dismantling and construction work.

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2. Load-bearing structure

2.1 The old building / Appraisal of the existing structure and analysis of its condition

Fundamentally, the load-bearing structure is a steel structure. The load is transferred via a steel framework (Fig. 2) which runs across the width of the building which comprises the primary load-bearing element and is supported on reinforced concrete strip footings.

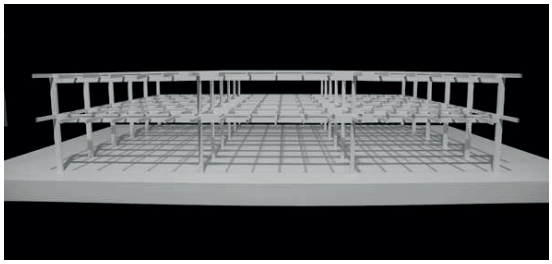

Fig. 2: Model of the steel load-bearing framework

The rigidity of the building is achieved by a spatial load-bearing frame consisting of the transverse steel frame described above in conjunction with longitudinal frames.

After on-site examinations and inspections by EMPA and ETH Zurich the examination of the load-bearing capacity of the existing steel structure and its suitability for use in practice followed with the conclusion that the structure has extra load-bearing capacity which is sufficient for the new requirements arising from the alteration work.

2.2 Alteration and extension of the load-bearing structure

The changes in the use of the building (2 passenger levels) and the special requirements arising from the mixed use for Schengen / non-Schengen facilities led to a need for numerous vertical access zones. In addition, large openings in the floor/ceiling elements near the outer facade formed part of the architectural plans. In many places this required penetrations of the floor/ceiling elements and other changes, some of them drastic, in the original load-bearing structure.

To ensure a high degree of flexibility in the position of the openings for access zones around the edges of the building, steel supports were inserted along the length of the building on both storeys in the middle of the outer spans of the frames.

Fig. 3: Dock B after alteration work

The new supports facilitate a flexible removal of parts of the ceiling and the frame girders in the floor/ceiling element above the ground floor and ensure that the increased loads of the staircase and escalator bases can be transferred. They also form additional bearings to support the frame girders in the floor/ceiling above the first floor.

In the course of the alteration work (Fig. 3), the viewing terrace was covered by a large roof. Following the grid of the existing load-bearing structure a symmetrical roof truss was placed as the main load-bearing element in each transverse axis of the building. The trusses were implemented as welded trussed beams with arch with haunched cantilevers on both sides. Over the atriums, a connecting rod links the trussed beams with storey G1 to enable the load to be transferred.

3. Conclusion

The newly opened Dock B at Zurich Airport is an outstanding example of the responsible and creative way that the client and the planners used the historical fabric of the building, and it is internationally recognised as a successful alteration project.