



## Seismic Resistance Analysis and innovative Earthquake Refit

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### Summary

The office building housing in Windisch was fully renovated and also raised by one storey in the summer of 2011. In addition the buildings seismic resistance was also increased.

The initial calculations of the structure's earthquake resistance indicated that only 10% of the earthquake resistance required by the latest standards could be guaranteed without additional strengthening of the structure.

The strengthening System which was used was the StressHead CarboStress System which involved the installation and post-tensioning of Sika CarboDur CFRP plates. In total, 16 of these post-tensioned plates with a tensioning force of 220kN were used. The anchorage of the tensioning force was achieved with a combined CFRP StressHead and steel reaction frame to transfer the load directly into the floor slabs.

**Keywords:** Seismic engineering; masonry strengthening; post-tensioned CFRP plates.

### 1. Introduction

To improve its facilities, the Agrisano health insurance company wanted to extend its existing office building at Steinackerstrasse 7 in Windisch, Switzerland, by adding a new cafeteria and service areas. The building is located between the Brugg railway station and the campus of the University of Applied Sciences for North West Switzerland, and as space around the building was limited, it was decided to do this by raising it by one additional storey.

Construction work on the project began in spring 2011 on the office building that dates originally from 1975. In addition to the additional storey being added, the building underwent extensive insulation and energy saving improvements, plus its seismic resistance was considerably increased. The reception area on the ground floor had ceased to meet the owner's standards and was also completely revamped in conjunction with the other works. The existing building consisted of 2 basement floors, the ground floor and 7 additional floors. The dimensions in rectangular plan were 14 x 34m. Before the additional storey was added the building was 25m tall. After raising it by one storey and locating the additional building services and equipment on the roof, it is now 30m tall.

The building is a skeleton structure, which consists of a grid of columns with a core on the access side, where the main shaft and all of the building services, toilets, stairs and the lifts are located. The space allocation in the rest of the building is flexible and based on movable partition walls.