

# Rhine Waterfalls (Switzerland)



## Project description

The Rhine Falls in Schaffhausen, Switzerland is one of the region's most important tourist attractions and visitors marvel at the spectacle from a terrace at the castle of Laufen and several platforms on the cliff beneath it.

Rock anchors previously installed to stabilise the cliff showed unexpected force changes, leading to concerns that some sliding surfaces had developed.

To ensure the ongoing safety of the terrace, it was decided to install 11 additional rock anchors, together with a structural health monitoring (SHM) system to monitor anchor force changes and thus provide early warning of any future rock movements.

## mageba scope

A ROBO®CONTROL "Permanent" SHM system was installed in 2010 to monitor the forces in the newly installed rock anchors. The system transmits all data to a central server, enabling the responsible engineers to monitor all anchor forces from their offices via a web interface.

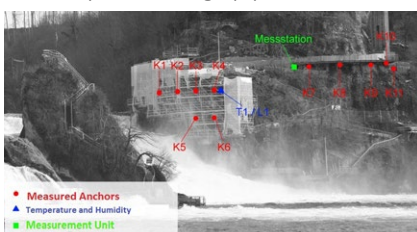
The engineer set limitations for the anchor forces, which are implemented in the system's alarm notification feature. Should any limitation value be exceeded, immediate notification will be sent by email and SMS to the engineer and the owner. This enables the owner to have confidence in the structure's condition at all times, avoiding the need for much more extensive and invasive strengthening work.

## Highlights & Facts

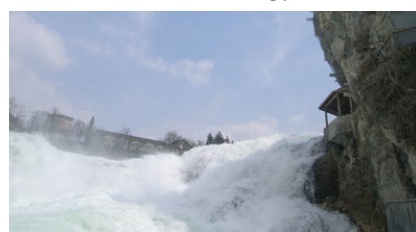
### mageba products:

Type:	ROBO®CONTROL permanent "Advanced"
Features:	Crack sensors, inclination sensors, accelerometers, and structural temperature
Installed:	2012
<b>Structure:</b>	
Country:	Taiwan
Built:	2007
Type:	Concrete box girder bridge
Length:	Each span 35 m

Scaffolding on the cliff face during installation of the SHM system, showing equipment locations



The sensors are discretely positioned and barely visible from the waterfall viewing platforms



Example of data presentation on the ROBO®CONTROL system's web interface

