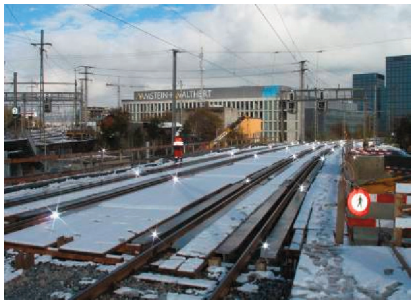
Leica Geosystems TruStory
Monitoring of Rail Tracks and Construction Site

Reconstruction of the 100 year old railway bridge carrying two railtracks.

BSF Swissphoto AG has developed a powerful tool for permanent monitoring applications called DeTraS (Deformation Tracking System). Sensor control and database management is provided by Leica's GeoMoS Software.

During 2008 and 2009, a 100 year old bridge close to the Oerlikon Railway station was renovated. The old steel construction was replaced by restressed ferroconcrete and the span width was increased from 15m to 38m. In order to excavate the existing bearings, pillars, undercrossings and rail dam on the eastern side, assistant bridge elements were constructed. These temporary bridges lay 80 cm higher than the old tracks and created the required space to build the new bridge.

Torsion is the term used to describe the twisting of the tracks and it acts as one of the most critical factors in rail track geometry. During the first construction period rail settlement and the resulting torsion changes were manually measured each week. This was labor intensive and resulted in high costs due to the risk potential of the construction site.



Monitoring prisms on the temporary bridge for deformation tracking.

Due to the compact and fast installation possibilities of DeTraS, the entire automatic monitoring system was set up by 2 people, in 11/2 days and delivering its first results.

Company
BSF Swissphoto AG, Zurich

Challenge
Rail track, bridge and site monitoring under dense railway traffic

Customer
Swiss Federal Railways

Date
2008-2009

Location

Project Summary

Instruments
Leica TCA2003
Meteo sensor
Leica monitoring prisms
WebCam

Software
Leica GeoMoS Monitor options 1 & 2
BSF Swissphoto's client portal

Aim
To monitor settlement and torsion of tracks and 3D deformations of pylon and bulkheads

- when it has to be **right**

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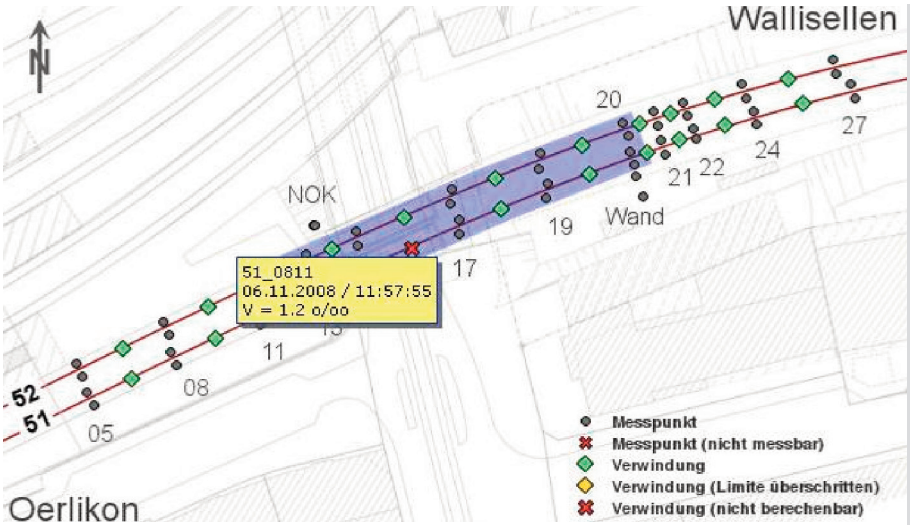


Start view of BSF Swissphoto's own client portal. The interactive map which comes up with all monitoring points and their actual state of measurements. The red lines represent the two rail tracks and the green diamondss indicate the specific torsion.

Benefits

- Safety, SMS and e-mail alert for the railway traffic
- Efficiency, BSF Swissphoto client portal for 24h access to real time data
- Analysis, continuous 24h monitoring of the construction site and the impact on crucial infrastructure
- Safety, limited staff access to dangerous construction sites
- Cost reduction, from reduced labor costs
- Efficiency, coordination of rail alignment actions according to the torsion calculations

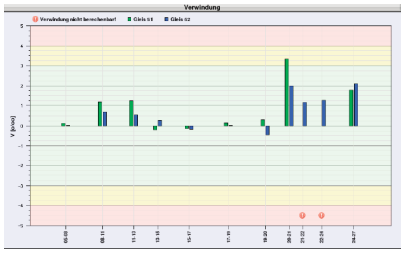
During demolition of parts of the foundation of the power line pylon, the monitoring systemwas used to detect 3D deformations and the resulting change in tilt.

The monitoring equipment included a Leica TCA2003 total station, meteo sensor, 55 monitoring prisms and a communication box for remote control and data delivery via the mobile communication network.

Actual deformations of rail geometry (settlement, torsion, and longitudinal profile) were based on the positional change of each monitoring prism. Site measurements were automatically transmitted to Leica's GeoMoS Software located in the office. In the case that the restrictive limits of the railway company were exceeded, SMS and e-mail alarms were sent to the responsible persons. Possible problems with the rail alignment could also be determined and fixed quickly and efficiently.

Single point settlement and uplift after mechanical track alignments on the dam.

In order to monitor the torsion of the track, inclination values were computed from the settlement measurements. Using 2 settlement measurements at one cross section results in one inclination computation. Comparing this inclination to the next inclination value along the track you get the torsion value, indicating the change along the track axis.



Torsions at the different sections show when they exceed the two limit classes.

The main advantages of automatic monitoring compared to manual monitoring are increased safety, increased awareness of deformations, improved efficiency, and reduced costs.

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- when it has to be **right**

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