WELCOME TO LE34

LE34 is the leading provider of surveying and land management services in Northern Europe.

From 25 offices in Denmark, Sweden and Norway our more than 300 surveyors and land tenure experts help turn ambitious infrastructure and construction projects into reality.

Søren Nørmølle, Partner
Why Construction monitoring?

New Austrian Tunnelling Method:

Do not dimension for the unknown, but redesign on the fly, while knowledge about the actual circumstances are acquired.

Source: “An insight into the NATM”, M. Karakus & RJ Fowell 2004
Monitoring is safe and sustainable savings
4 case studies:

- Cut’n Cover
- Top-Down
- Ground Freezing
- Pipe-Jacking

Source: http://www.railsystem.net/
Source: http://www.unitracc.com/
Source: http://simmakers.com/
Case 1: Cut’n Cover Nordhavnsvej tunnel

Benefits:
Lesser deviation led to saving half of the ground anchors through-out the project.

- +1,000 Physical Sensors
- +250 Virtual Sensors
- 20 Communication units
- 7 Access Points
- 2 Servers
- 2 Internet Systems
Benefits:

Just-in-time alignment of tracks replaces planned scheduled alignments

Case 2: Top-Down Køge Road-tunnel

1 Totalstation, Trimble S8
300 Armoured Prisms
1 Modem
1 Server
Case 3: Ground freezing, Nørreport st.
Case 3: Ground freezing, Nørreport st.

Benefits:
The 24-7 observation system allows for close tracking of the effects of the ground freezing.
Case 4: Pipe-jacking, Østerbro cloudburst tunnel

2 Totalstation, Trimble S9
360 Armoured Prisms
1 Modem
1 Server
Case 4: Pipe-jacking, Østerbro cloudburst tunnel

Benefits:
Automated monitoring replaces expensive manual measurements on the tracks during night.
System design

Trimble 4D Control
On-the-fly:
• Processing
• Calculation
• Evaluation and
• Alert

Alerts and Alarms by SMS and e-mail

Automatic and Manual Sensors

GeoTech obs: kN / strain

Geodetic obs: XYZ

Monitoring DB
Staff:

Managing team
Head of Monitoring
Geodesy Engineers
Geographer

On-site Pro’s
Land surveyors
Communication technicians
Construction Engineers

Assistents
Construction Workers
Trainees
Students
Monitoring is safe and sustainable savings