



8th INTERNATIONAL CONFERENCE
“CONSTRUCTION SAFETY & HEALTH”

26 & 27 May 2023

Hotel Hilton Nicosia,
Engomi, Cyprus

Risk Assessment and work in
steep dangerous environment



The role of Engineers and Contractors

- Environment
- Individual access or/and Collaboration
- Hazards
- Case studies
 - Rockfall protection in high mountain areas
 - Suspension bridge in the mountains
- Conclusions



Environment

- Steep slopes
 - Covered with vegetation – trees, bushes
 - Not covered
 - Stable or unstable
- Rock slopes
 - Rock condition – weather, compact
 - Stable or unstable



Individual access or/and Collaboration

- Role of designer
 - Project objective
 - Laws to be observed – Worker’s Protection Act, Construction Coordination Act
 - Identification of hazards
 - Assessment of hazards
 - Mitigation of these hazards – possible solutions
 - Tendering process
- Role of contractor
 - Laws to be observed – Worker’s Protection Act, Construction Coordination Act
 - Continuous Training of staff
 - Selection of equipment – personal safety equipment, working stuff,
- Collaboration
 - Selection of contractor
 - Discussion of execution methods
 - Site equipment



Hazards

- Remote site
 - In the HS- plan, all collective measures are to be defined (measures which concern ALL companies => e.g.: Fire extinguishers, access roads, entrances,..).
 - Individual measures (e.g.: for drilling work, use of PPE,...)
 - Additional first aid equipment – rescue stretcher
- Site access
 - Road – suitable for which type of cars
 - Information to rescuing organizations
 - Path – to be secured by safety measures – lining, ladders, ropes etc....
 - Access only by helicopter



Hazards

- Environment
 - Cleaning of slopes – how often, when, ..
 - Avalanches – identification and assessment
 - Clearance of access and working area – who, when,...
- Weather conditions
 - Daily check of weather forecast
 - Leaving of construction site possible – under which conditions
 - Leaving not possible – additional site equipment (e.g. sleeping container)
 - Thunderstorm – immediate stop of work when lightening danger occurs



Hazards

- Ground and rock conditions
 - Assumptions on conditions have to be communicated
 - Dry, wet, frozen...
 - Soil classification, rock classification by geotechnical engineer – crosscheck
 - Changes have to be reported immediately to designer
- Working staff
 - Training – regular safety day for the whole staff before sent to site
 - Equipment – additional checking before going on site for PPA and machinery (drilling units, excavators, grout injection machinery, etc.)
 - ...

Case Studies

- Rockfall protection for a hydroelectric power plant – pipeline

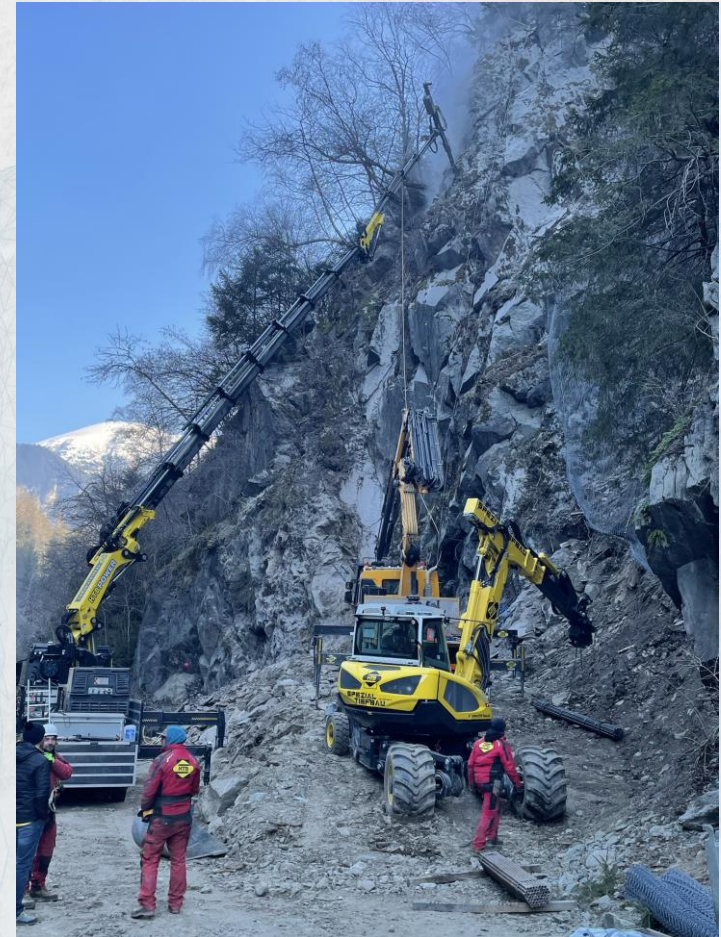
In the course of the construction of a pressure pipeline, a high rock face had to be secured in front of a tunnel area to secure the work for laying the pressure pipeline - permanently above the tunnel portal and temporarily in the train entrance area for the excavation and pipe-laying work.

Pressure Pipeline and tunnel portal



Left – site plan with pressure pipeline and tunnelportal

Right – rockfall protection net providing a secure site for excavation and drilling followed by netting – workes are outside of hazards





Automated drilling from
remote steering unit after
cleaning of rock slope



Slope stabilization works

- Slope stabilization with high quality mesh and nails – 6-8 m long, grouted
- Drilling works from a climbing excavator with drilling unit mounted assisted by two workers
- Workers secured by rope – rope access

Case Studies

- Suspension bridge in high alpine

As a tourist attraction and access to a viewing platform, a footbridge was built at the summit of Dachstein, the highest mountain in Upper Austria. The challenges at an altitude of almost 3000 m were the weather conditions - snowfall even in summer and the vertical to overhanging rocky terrain.

Dachstein suspension bridge

- Site plan with suspension bridge and access path and viewpoint – areal view
- Access to site by areal tramway
- Site situated in 2900 m level above sea



Drilling works

- Drilling works – all equipment secured by ropes
- Workers hanging in ropes
- Access to drilling points by climbing





Formwork and erection process

- Formwork transport by helicopter
- Concrete transport by helicopter from the bottom station of areal tramway
- Erection process of access path



Dachstein Scenic view point and suspension bridge

Conclusions

- Projects in steep environment can only be successful in collaboration of designer and contractor
- Designer must be familiar with the hazards in this environment
- Selection of contractor is essential – contractor must be also familiar with the challenges and hazards
- All participant have to be trained on a regular basis
 - They must be aware of the dangers and hazards
 - They must be trained to move and work in this steep surrounding
 - They must take responsibility for themselves and their colleagues and be able to rely on it

The background is a light-colored, textured surface with a faint blue architectural sketch. It features a construction crane at the top left and several tall, rectangular buildings rendered in a wireframe style, suggesting a city skyline under construction.

Conclusions

Everyone has his role to play!



Thank you!

Any questions?