

FLEXIBLE SLOPE STABILIZATION SYSTEMS

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Geobrugg in India

- Geobrugg started its operation in India in June 2009. Geobrugg India is a fully owned subsidiary of Geobrugg AG, Switzerland.
- Geobrugg is the first company in India to supply and install an ETA approved rock fall barrier on an NHAI project in Jammu & Kashmir.
- Geobrugg has installed 22 rockfall barriers and more than 2 lacs square metres of slope stabilization system in India.
- HQ is in Gurgaon, with offices in Mumbai & Guwahati & site office in Udhampur, J&K.
- Fully capable of providing design and execution support to client in India.



Slope Stabilization

- Protection against:
 - Landslides
 - Rockfalls
- Triggered by:
 - Uncontrolled excavation
 - Gravity
 - Water influence
 - Seismic events
 - Geometry changes
 - Weathering /erosion
 - Uncontrolled blasting



Flexible Slope stabilization

- Types of facing

According to the European Norm EN 14490:2010

Hard facing



Flexible Facing



Soft Facing



Hard facing : Shotcrete



| Positive | Negative |
|---------------------|---------------------------------------|
| strength | not eco friendly |
| stiffness | huge visual impact |
| good adhesion | low initial strength (initial cracks) |
| all geology capable | demanding technology of installation |
| | problems with drainage |
| | expensive |
| | complicated maintenance |
| | once cracked, loses capacity |

Soft facing



| Positive | Negative |
|-----------------------------------|---------------------------------|
| greening possible | low tensile strength |
| good anti-erosion characteristics | additional reinforcement needed |
| low costs | not UV stable (mostly) |
| | gets stiff and brittle |
| | no pre-tensioning possible |
| | does not work with nailing |
| | not fire resistance |
| | very low shear resistance |
| | no dimensioning possible |

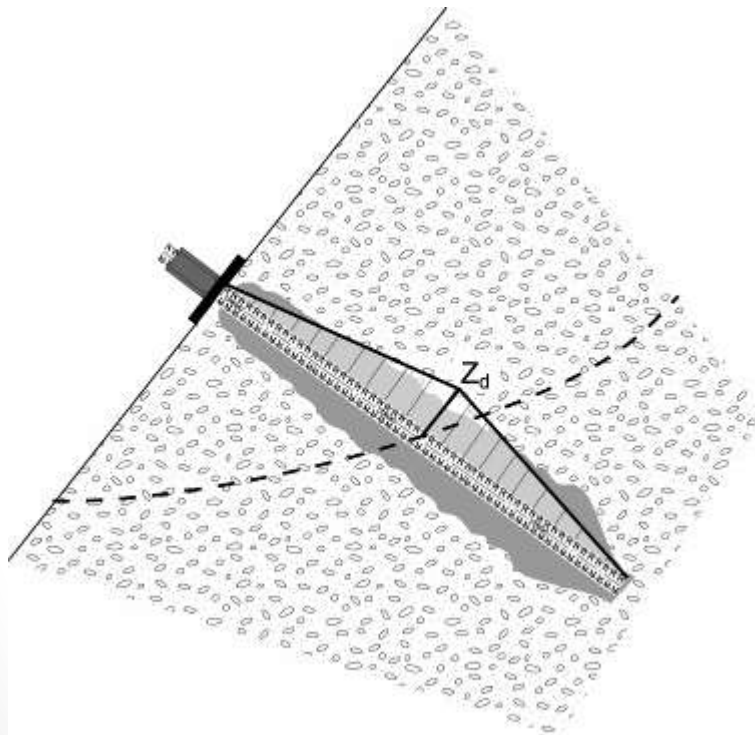
Flexible facing



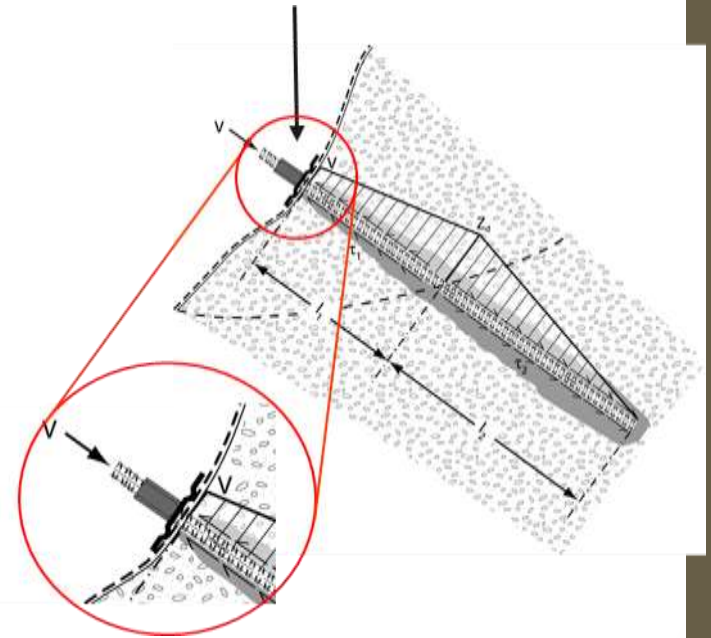
| Positive | Negative |
|--------------------------------------|----------|
| greening possible | |
| great aesthetics (low visibility) | |
| rapid and easy installation | |
| seismic resistance | |
| minimal deformability | |
| possible dimensioning | |
| any type of geology applicable | |

Influence of facing

No facing - max tensile force at the nail head ≈ 0 kN!



With facing - tensile force transmission in the nail head is possible (nail activation)



The System

- Consists of 3 components

High Tensile Steel Wire Mesh



Spike Plates



Soil Nails



High Tensile Steel

– Pre tensioning possible



Laboratory test to determine the puncturing resistance of the flexible mesh.

Puncturing resistance of high tensile steel wire mesh made of 4mm dia can go upto as high as 370 KN



High Tensile Steel Wire Mesh
 $F_t \geq 1770 \text{ N/mm}^2$



Mild Steel Mesh/Gabion Mesh
 $F_t \geq 450 \text{ N/mm}^2$

Benefits for you!

Advantages : To sum up

| No. | Feature | Advantage | Benefit |
|-----|---|---|--|
| 1 | <u>High tensile steel</u> min. 1770 MPa | Pretensioning possible | Minimized deformations, active support |
| 2 | <u>System elements</u> optimized to work together | Optimal force transmission, huge bearing capacity | 100% safe, correctly dimensioned solution (proven) |
| 3 | <u>Rhomboidal</u> chain-link structure with knotted wire ends | Perfect adaptation to slope geometry | Active slope deformation counteracting |
| 4 | <u>Low weight</u> and high strength | Fast installation, low environmental impact | Low cost and fast installation, greening possible |
| 5 | <u>Edge corrosion protection</u> | Long lifetime | Low maintenance costs |

Case study : Slope Stabilization on NH 21 Kiratpur – Ner Chowk Expressway, Himachal Pradesh

System:
High Tensile Steel Wire Mesh (3mm)
Soil nails (6m)
Erosion Control Mat (Coco Fiber) with seed pockets





Thank You

