MISTAKES AND DEFECTS IN USING GEOSYNTHETICS IN CONSTRUCTION INDUSTRY

9. April 2008 – Prague
10. April 2008 – Brno

GS Reinforced Structures In Alpine Regions - case studies

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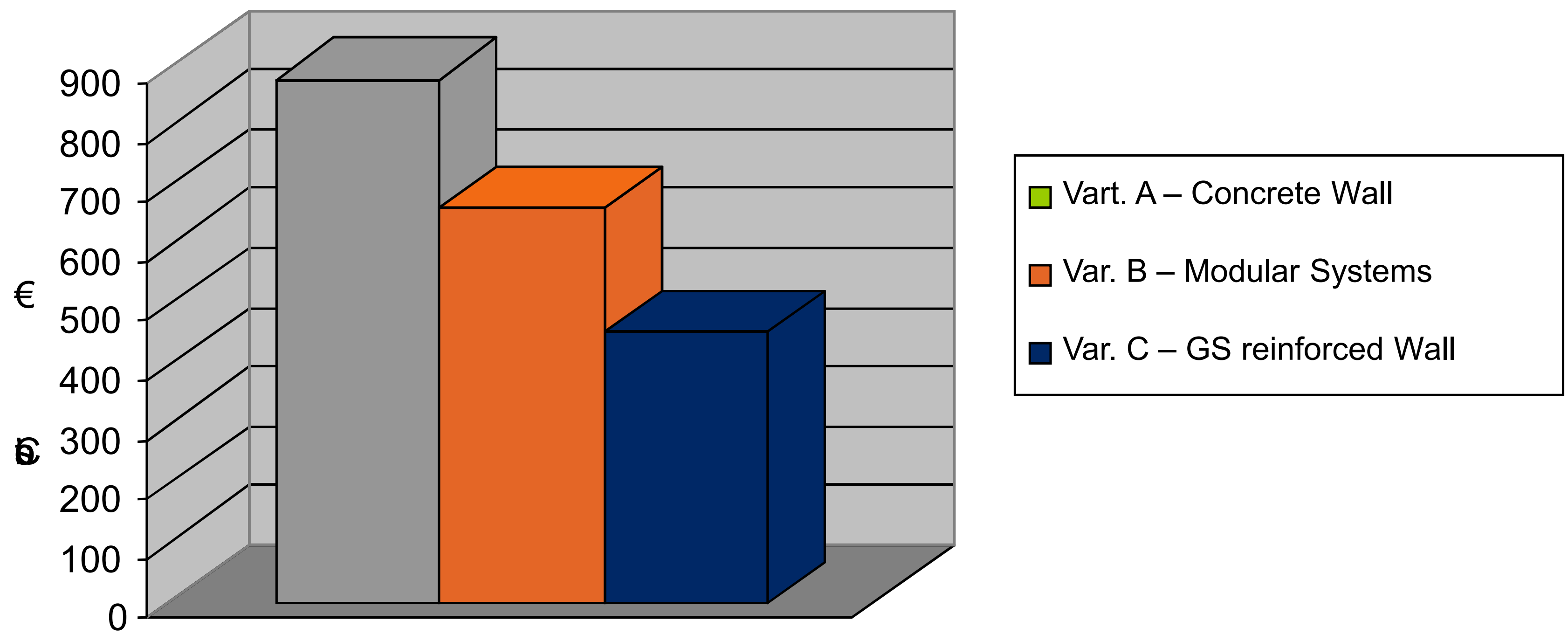
International Geosynthetics Society - Česká republika

GS Structures in Alpine Regions
Introduction

- Criterias for the selection of construction method
  - Safety aspects
  - Availability of material
  - Duration of construction
  - Ecological aspects
  - Attractive optical appearance
  - Accessibility
  - Construction costs
  - Etc.

GS Structures in Alpine Regions
Comparison of Systems– TU Graz - Costs € / m² frontview



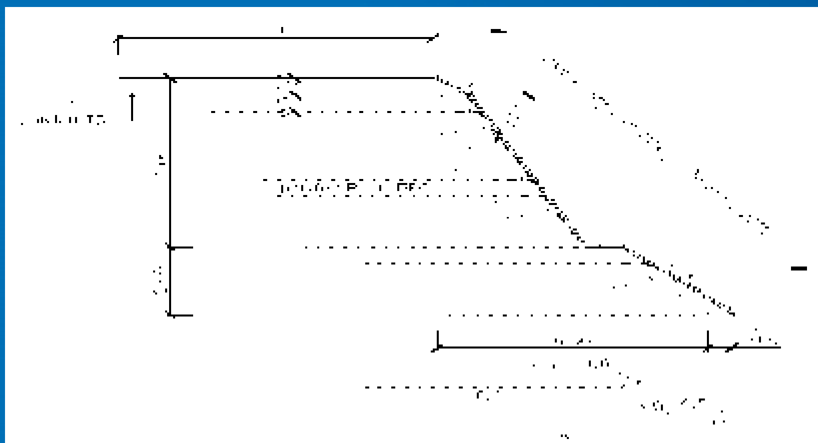
GS Structures in Alpine Regions

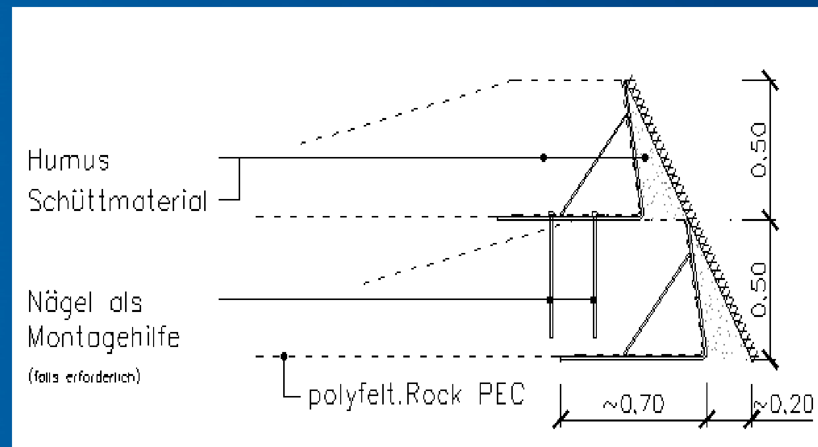
Case Study - Eiblschrofen

- 2 Protectiondams:
  - 25m height
  - Basis 80m
- 180.000m³
- construction < 2 month
- WLV Tirol, TU Wien, ILF
- System polyslope S
  - Distance of layers 50 cm
  - 100 kN/m tensile strength
  - Anchor length 6,0m

GS Structures in Alpine Regions

Case Study - Eiblschrofen





GS Structures in Alpine Regions

Case Study - Eiblschrofen

GS Structures in Alpine Regions

Case Study - Eiblschrofen

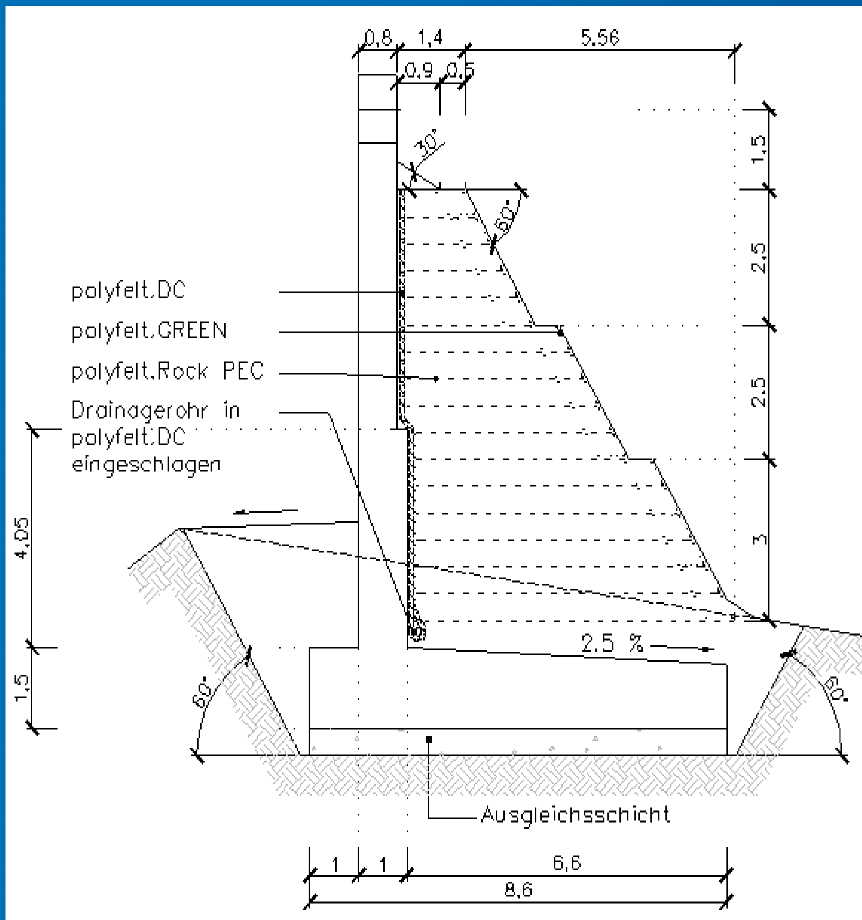
GS Structures in Alpine Regions

Case Study – Avalanche Protection Lanersbach

- Height 10 m, 60°
- Statically independent Concrete Wall
- System polyslope S
  - Layer distance 50 cm
  - Tensile strenght 50 kN/m

GS Structures in Alpine Regions

Case Study – Avalanche Protection Lanersbach



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Case Study – Avalanche Protection Lanersbach

GS Structures in Alpine Regions

Case Study – Widening of skiing tracks

GS Structures in Alpine Regions

Case Study – Reconstruction of Mountain roads

GS Structures in Alpine Regions

Case Study Rodlau – Reconstruction of B115

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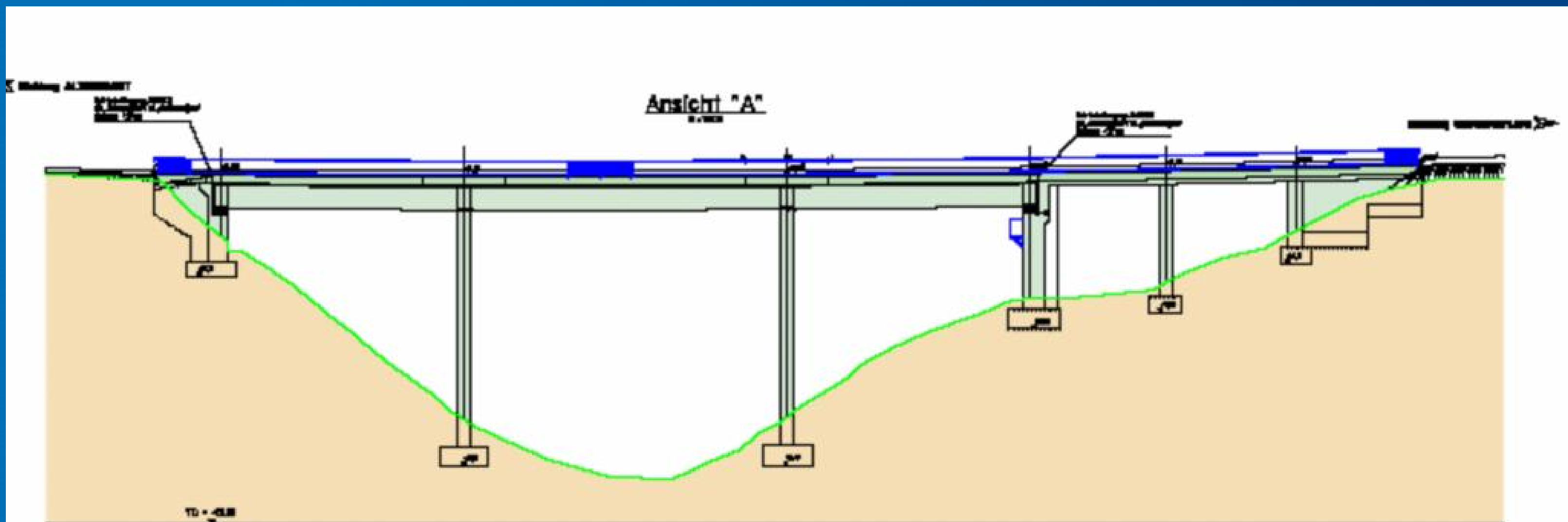
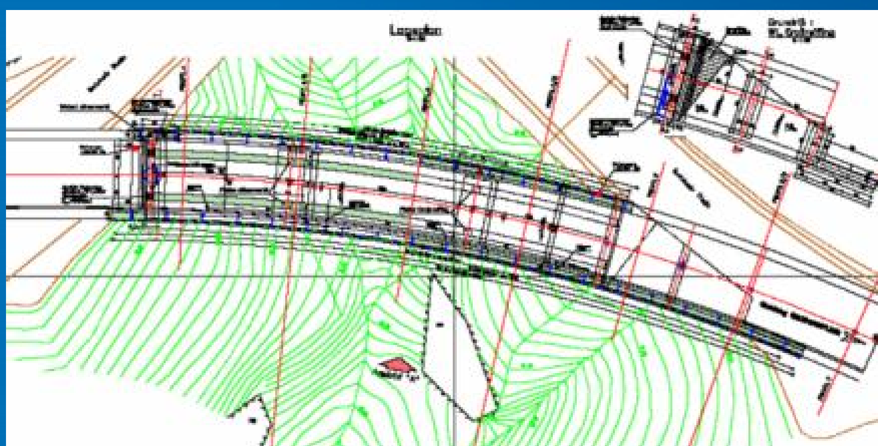
GS Structures in Alpine Regions

Case Study Rodlau – Option 1





Costs:

~ 900.000.- €

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Case Study Rodlau – Option 2

Facts and Figures:

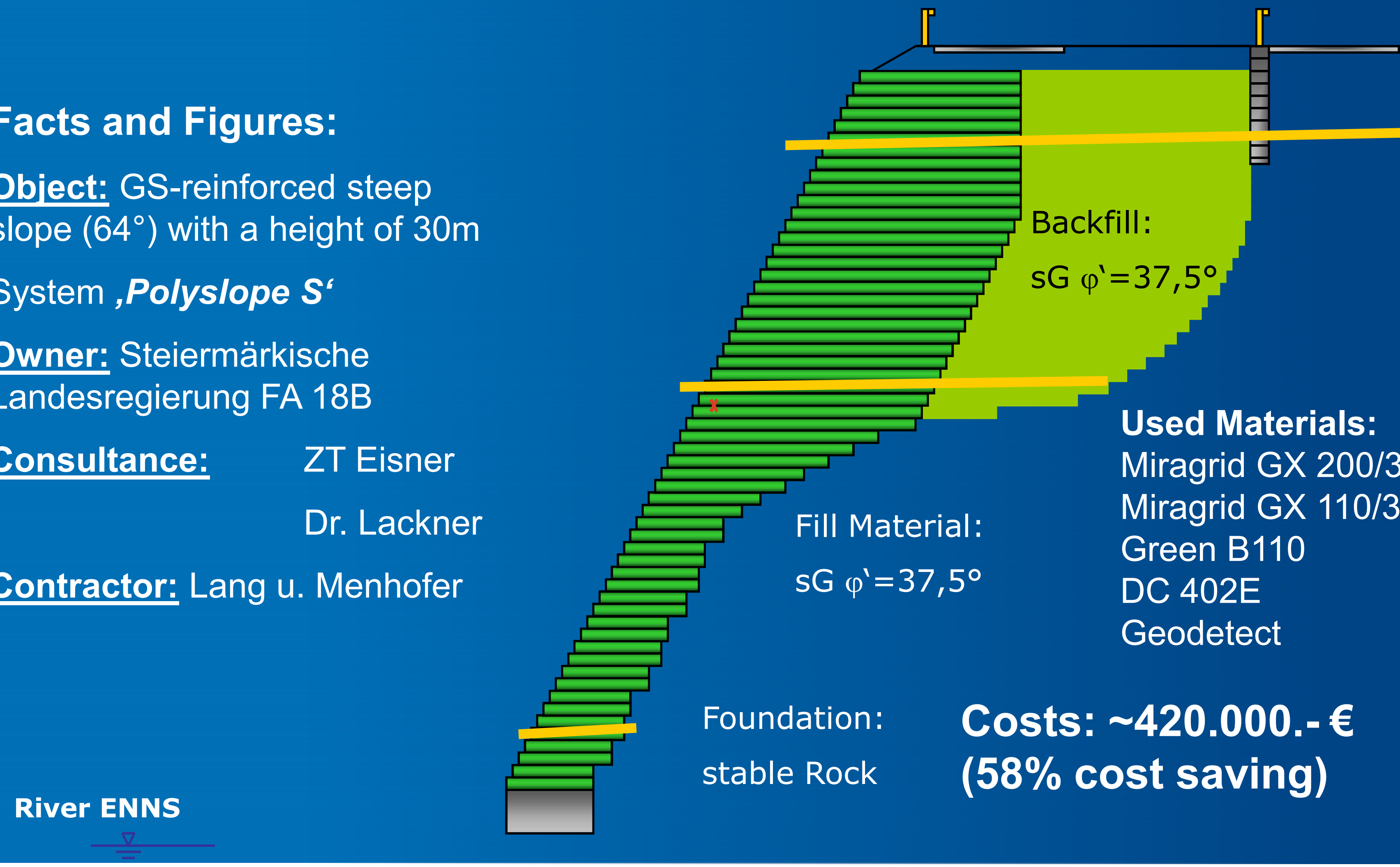
Object: GS-reinforced steep slope (64°) with a height of 30m

System ***‚Polyslope S‘***

Owner: Steiermärkische Landesregierung FA 18B

Consultance: ZT Eisner
Dr. Lackner

Contractor: Lang u. Menhofer

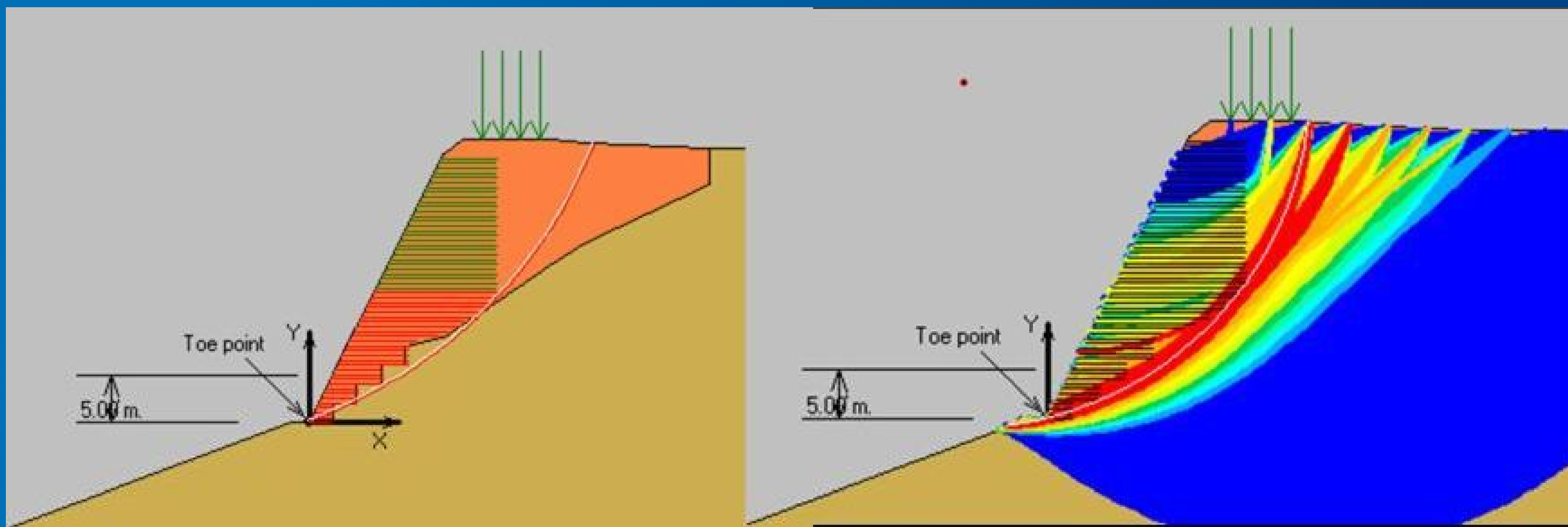


Used Materials:
Miragrid GX 200/30
Miragrid GX 110/30
Green B110
DC 402E
Geodetect

Costs: ~420.000.- €
(58% cost saving)

GS Structures in Alpine Regions

Case Study Rodlau – Design and System



- Design according to EBGEO
  - Internal Stability: Pull Out / Rupture
- External Stability:
  - Austrian Standard ON B 4433: Slope failure / ON B 4432: Base failure / ON B 4434: permissible earth pressure on facing

GS Structures in Alpine Regions

Case Study Rodlau – Design and System

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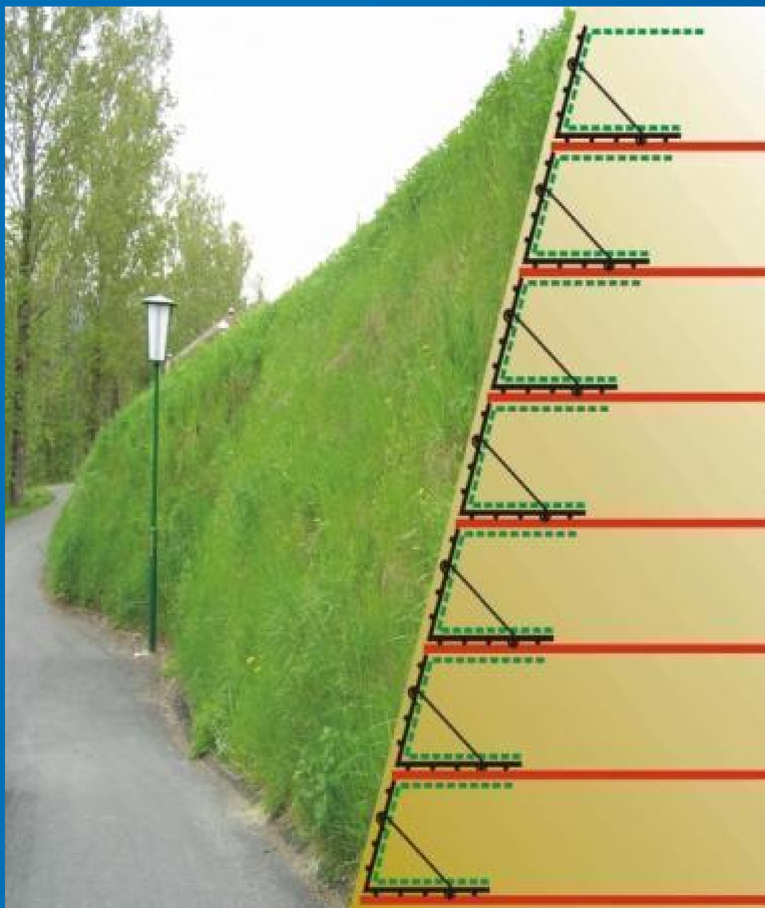

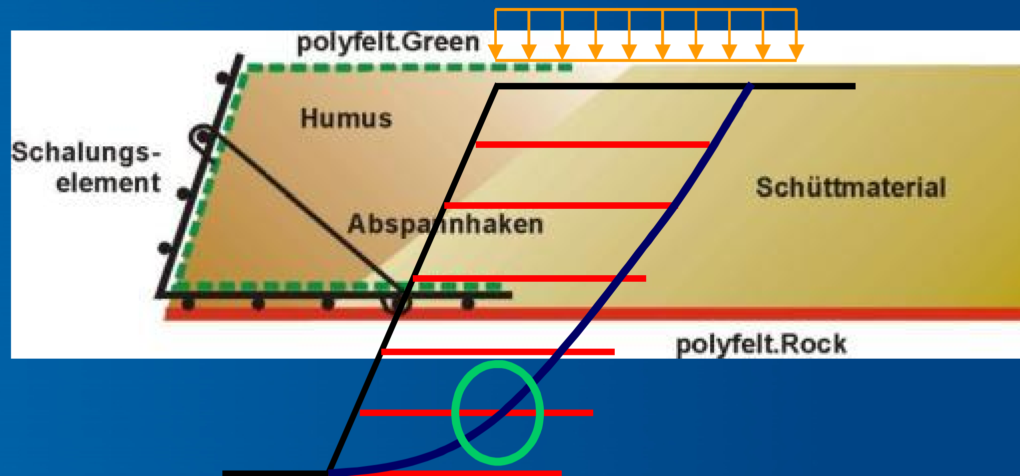

Properties [illegible]		Unit	GX 20/20F	GX 35/35F	GX 55/30F	GX 80/30F	GX 55/55F	GX 80/80F	GX 110/30F	GX 160/30F	GX 200/30F	GX 400/30F
Tensile strength (EN ISO 10319)	MD	kN/m	21	37	58	84	58	84	116	168	210	420
	min	kN/m	20	35	55	80	55	80	110	160	200	400
	CD	kN/m	21	37	31,5	31,5	58	84	31,5	31,5	31,5	31,5
	min	kN/m	20	35	30	30	55	80	30	30	30	30
Elongation (EN ISO 10319)	MD	%	12	12	12	12	12	12	12	12	12	12
	CD	%	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5
Typical long term tensile strength *) [illegible]		kN/m	10,2	17,8	32,0	46,6	32,0	46,6	64,1	93,2	116,5	233,0
Mesh size	MD	mm	20	20	20	20	20	20	20	20	20	20
	CD	mm	35	35	35	35	35	35	30	30	30	30

Forms of supply

Length x width	100 x 5,10	m x m	✓	✓	✓	✓	✓	✓	-	-	-	-
	50 x 5,10	m x m	-	✓	✓	-	✓	-	✓	✓	✓	✓
	50 x 2,50	m x m	-	✓	✓	-	-	-	-	-	-	-

GS Structures in Alpine Regions

Case Study Rodlau – Site Setup and Chronic

Daily Work:

At the beginning **100m³** fill/day

At half of structure **1.000m³** fill/day

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Case Study Rodlau – Deformation Measurement: GEODETECT

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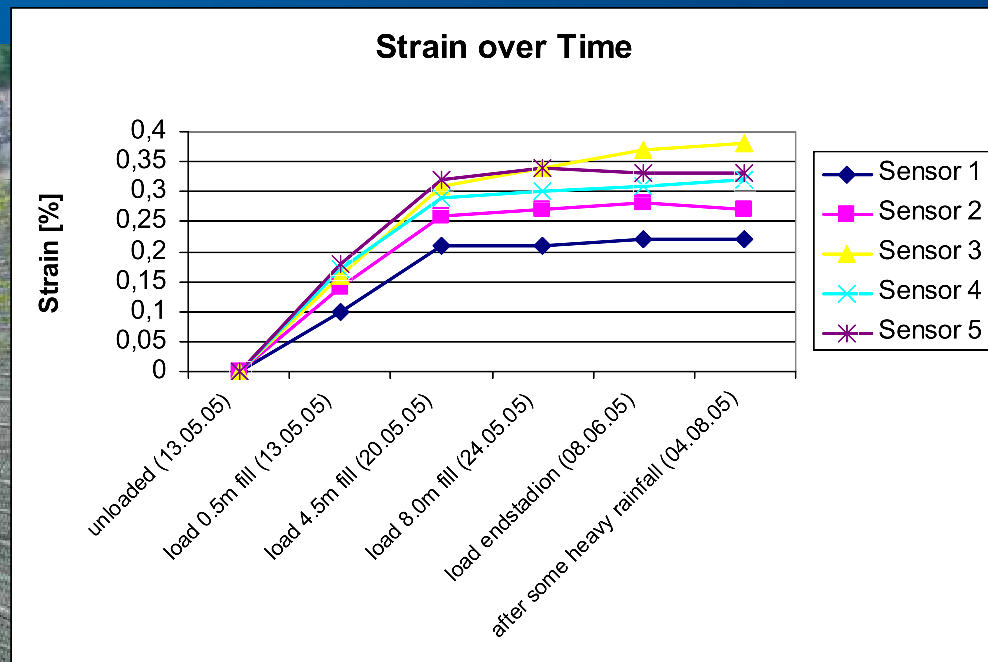


GS Structures in Alpine Regions
Case Study Rodlau – One Year Later

Stability Failure of An MSE During A Flood and It's Reconstruction

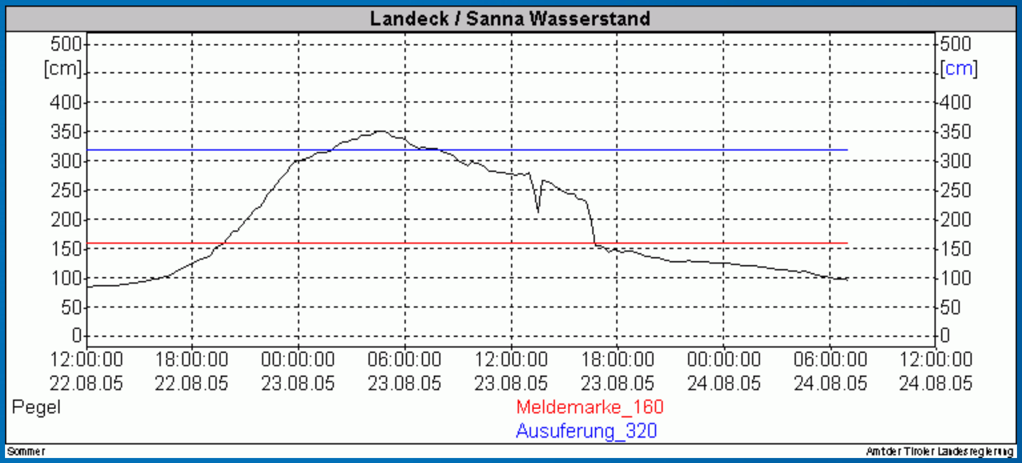
Location

Stability failure of MSE

Design and Construction

Stability failure of MSE

Flood Event and Failure



Stability failure of MSE

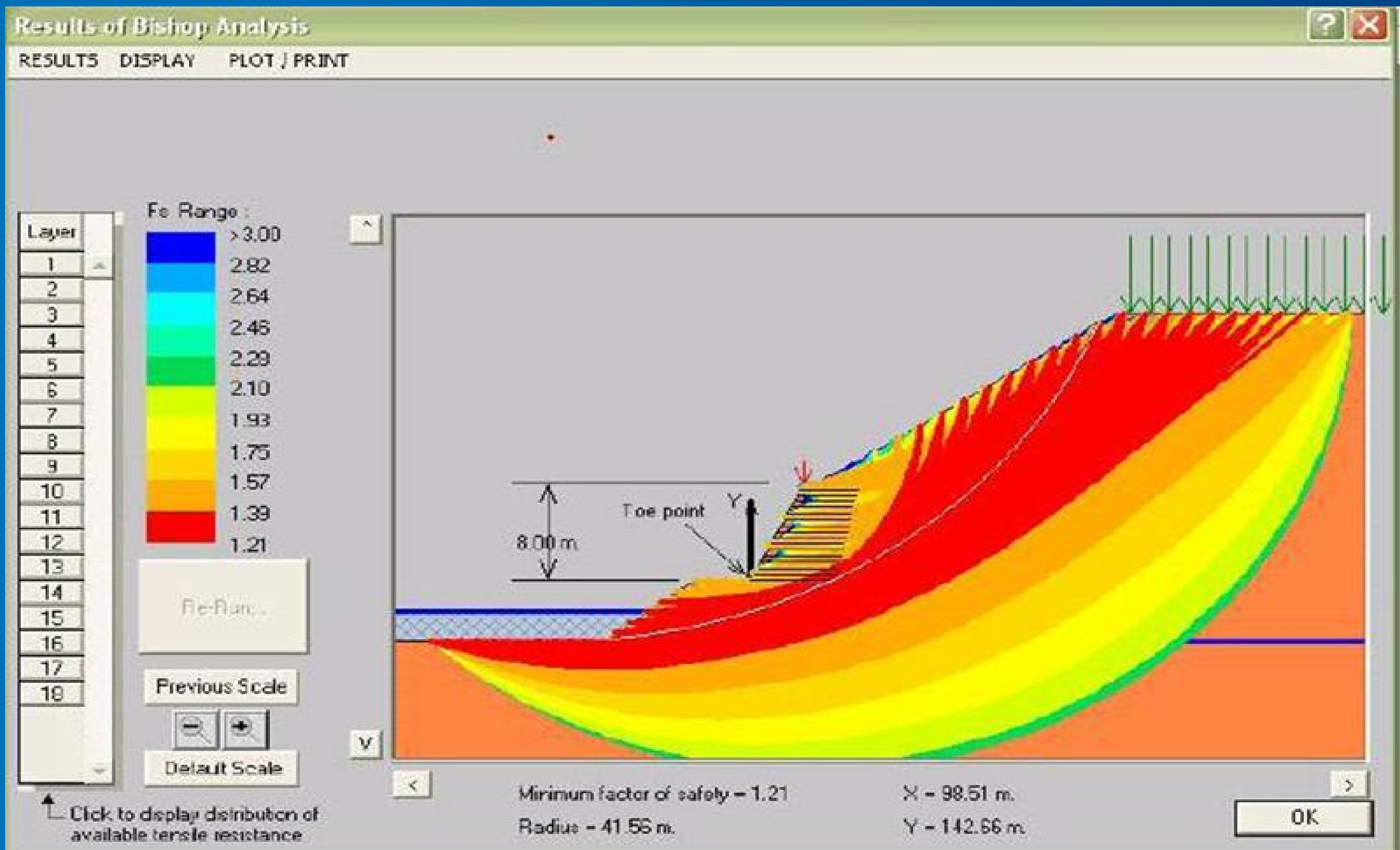
Flood Event and Failure

Stability failure of MSE

Flood Event and Failure

Stability failure of MSE

Reconstruction



Stability failure of MSE

Reconstruction

Conclusion (1)

- Geosynthetic reinforced walls and slopes are now established as alternative against classical construction methods in alpine regions due to several advantages
- Different Systems and products are now available on the market and perform very well
- Advantage in hard accessible areas due to the use of light construction devices
- Cost savings up to 40% compared to classical construction methods
- Attractive optical appearance due to green solutions

Conclusion (2)

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- In alpine regions specific boundary conditions of construction design have to be taken into account
- Safety behind civil structures depends on design assumptions which are not more than technically and economically selected parameters out of statistics with a certain remaining risk.
- The change in European climates has shown, that this borders have to be adapted to the new conditions.
- Never the less the construction method of MSE has proven that civil structures under extraordinary conditions, as to find in mountainous regions, expand the possibilities of carrying out infrastructure and building structures in an economical and technical way

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Thank you