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Gabion Structures and Design Criteria

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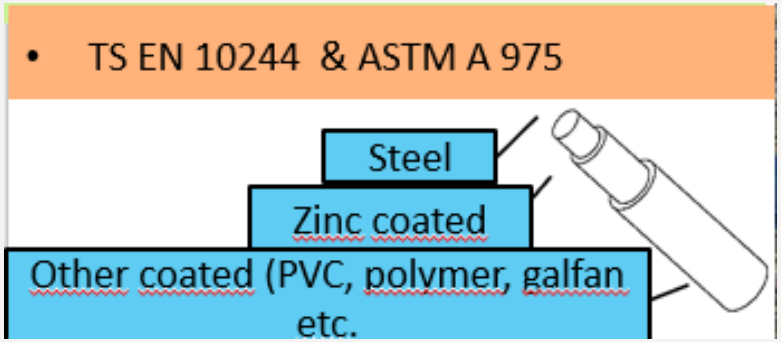
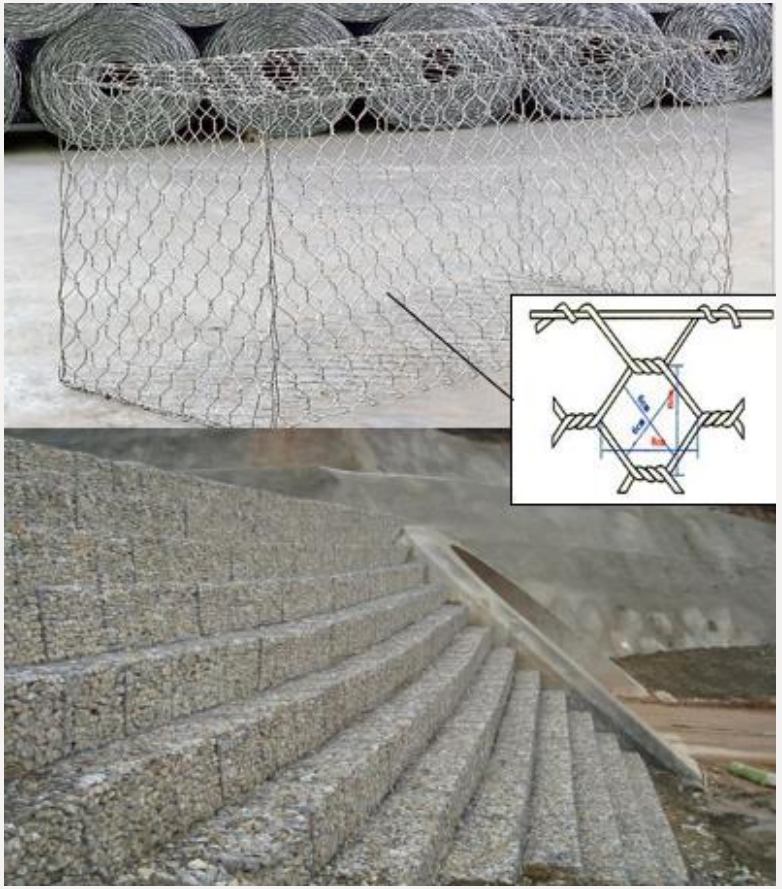
Content

- What is gabion?
- Areas of Usage
- Importance of Gabion
- Analysis
- Conclusions

What is gabion?

- Big basket
- Rectangular shape
- Hexagonal double-twisted and zinc coated steel wire mesh
- Filled with rocks or stones





Areas of Usage-1

- Retaining wall,
- In highways or railways,
- Erosion prevention,
- Slope stability,

Gabion Retaining Wall in Highway (Bolu Mountain Highway ,Tekno Maccaferri Web Site, 2005)

Gabion Retaining Wall (Wikipedia, Croatia, 2009)

Areas of Usage-2

- Stream bed improvement,
- Shoreline survey,
- Approach fill tunnel or bridge,

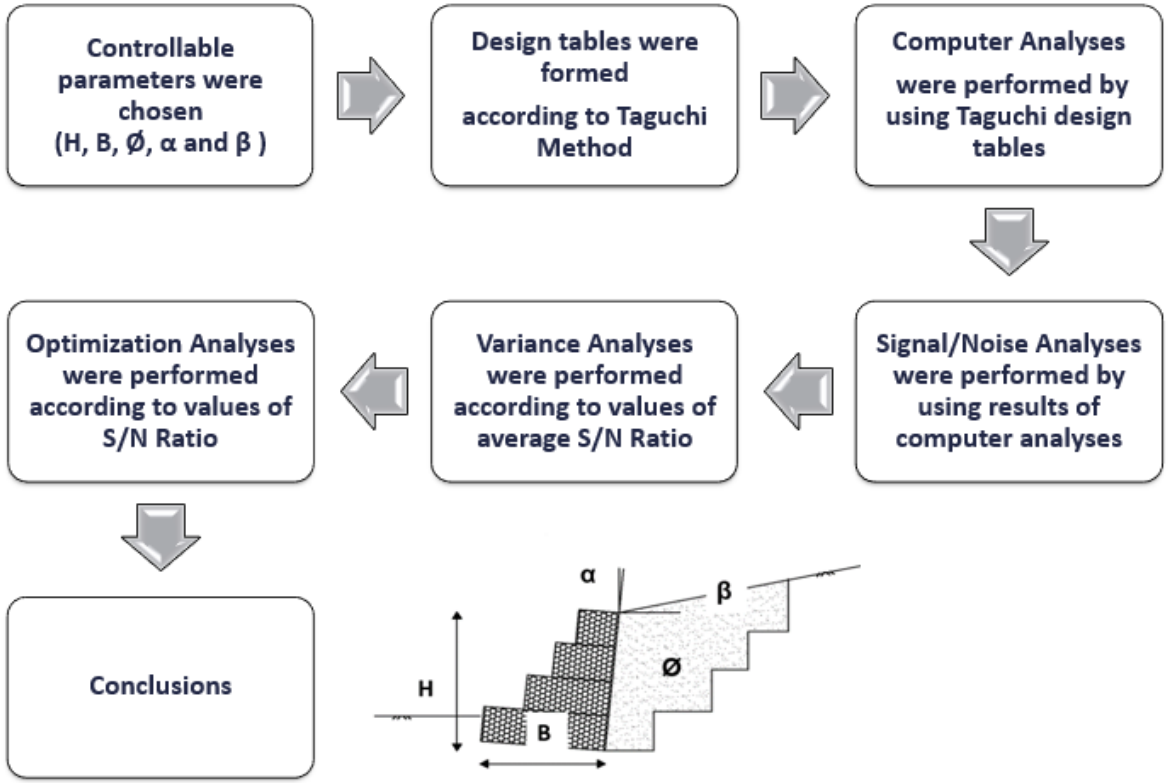
Konya-Ankara High-Speed Rail Line in Approach Fill of Tunnel (Tekno Maccaferri Web Site, 2010)

Western Black Sea Mattress Gabion in Stream bed improvement (Tekno Maccaferri Web Site, 2005)

What is the importance of gabion walls?

Criterion	Gabion Retaining Wall	Gravity - Reinforced Concrete Retaining Wall
Flexibility	Flexible	Rigid
Cellular Structure	It has	It has not
Drainage Precaution	Not necassary	Required
Cost	Low	High
Time	It is constructed in a short time	It takes a long time
Eco Design	It is	It is not
Maintenance and Repair	Not necassary	Required

Taguchi Method

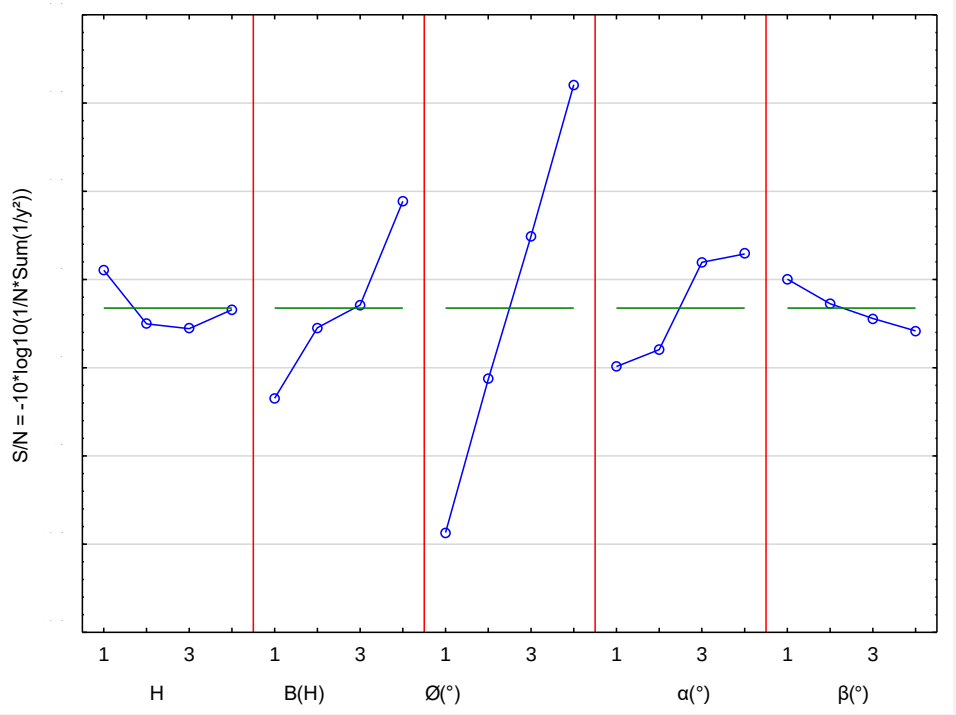


- Gabion retaining wall angle (α): 0°, 4°, 8° and 12°
- Slope of backfill (β): 0°, 5°, 10° and 20°

Controllable Parameters

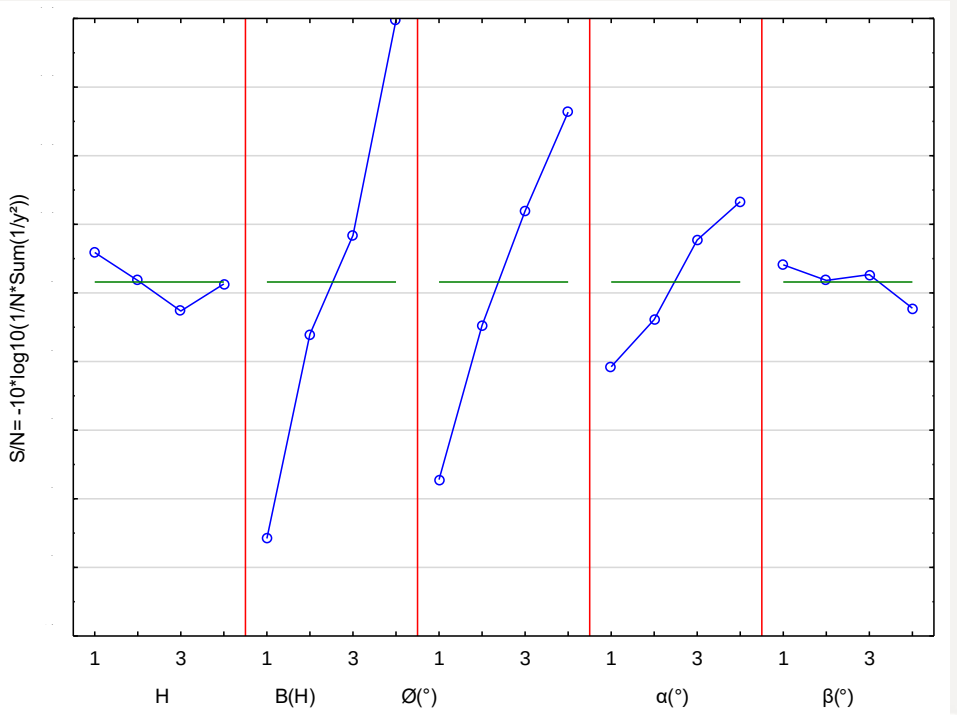
- Gabion retaining wall height (H): 4 m, 6 m, 8 m and 10 m
- Gabion retaining wall length of base (B): 0, 30 H, 0, 45 H, 0, 60 H and 0, 75 H
- Angle of internal friction of backfill (Ø): 15°, 25°, 35° and 45°

S/N Analysis

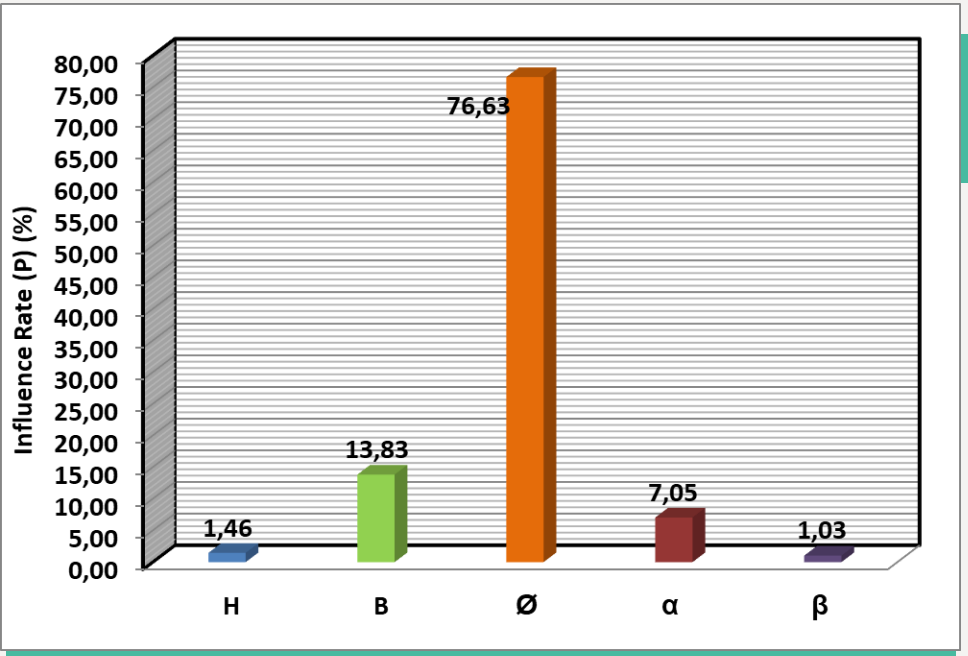


Influence rate on parameters safety factor for sliding

Influence rate on parameters safety factor for overturning

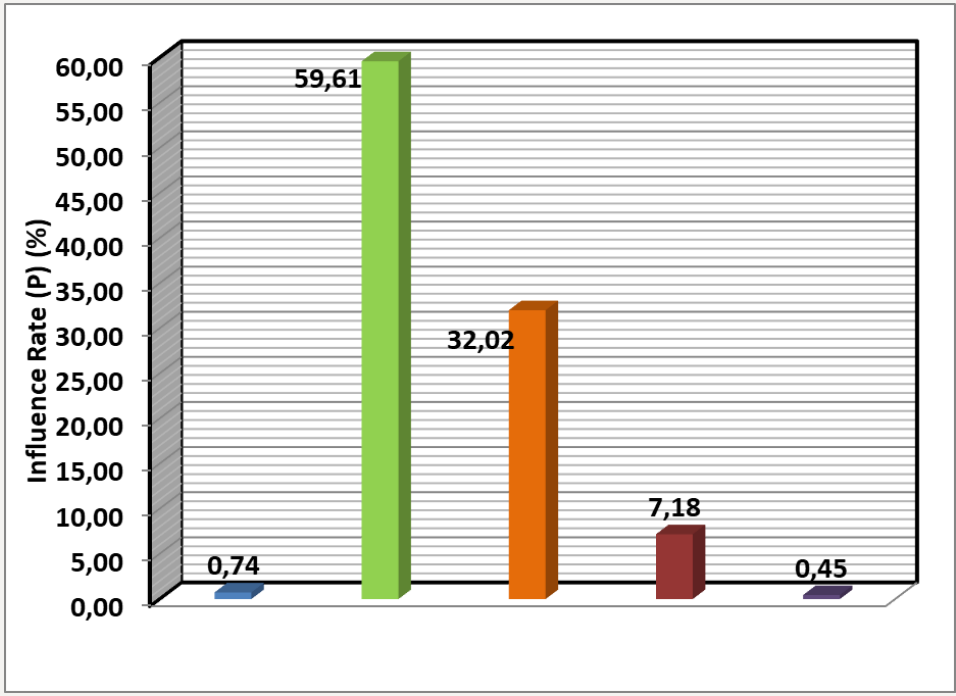


Variance Analysis



Influence rate on parameters safety factor for sliding

Influence rate on parameters safety factor for overturning



Optimization Analysis

	Maximum			Minimum		
	Parameter	Level	Level description	Parameter	Level	Level description
Check for sliding	H	1	4m	H	4	10m
	B	4	0.75H	B	1	0.30H
	Ø	4	45°	Ø	1	15^0
	α	4	12°	α	2	4^0
	β	1	0°	β	4	20^0
	Expected maximum safety factor Fs (max) for this level		16.28	Expected minimum safety factor Fs (min) for this level		0.13
	Found by verification analysis maximum safety factor Fs (max)		12.63	Found by verification analysis minimum safety factor Fs (min)		0.10

Optimization Analysis

	Maximum			Minimum		
	Parameter	Level	Level description	Parameter	Level	Level description
Check for overturning	H	1	4m	H	4	10m
	B	4	0.75H	B	1	0.30H
	Ø	4	45^0	Ø	1	15^0
	α	4	12^0	α	1	0
	β	1	0^0	β	4	20^0
	Expected maximum safety factor Fs (max) for this level		17,01	Expected minimum safety factor Fs (min) for this level		0.18
	Found by verification analysis maximum safety factor Fs (max)		17,60	Found by verification analysis maximum safety factor Fs (min)		0,11

Conclusions

- To obtain reasonable values , more detailed studies should be performed.
- In this study, varience and optimization analyses which was made by using Taguchi Method for safety factors of sliding and overturning show that results obtained from these analyses is close to real value.
- Consequently, Taguchi Method can be used in application of geotechnical engineering as an optimization technique.

...Thank you

for your kind attention