

NGO 2017

Stenen die vallen op geotextiel

Het verschil tussen vlies en weefsel en de invloed van de vorm van de op het geotextiel vallende stenen

Adam Bezuijen,
Deltares
Universiteit Gent

Inhoud:

- Schade door vallende stenen
- Theorie beschreven in: "Geotextielen onder steenbekledingen"
- Laboratoriumproeven
- Schademechanismen
- Aanpassing theorie?
- Conclusies

Schade door vallende stenen

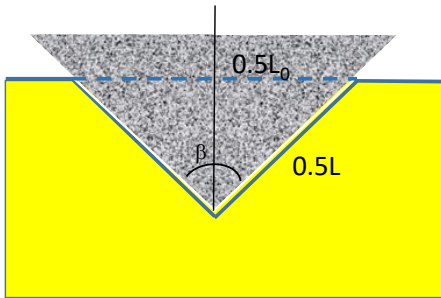
- In waterbouw is geotextiel vaak een filter.
- Onder water worden stenen gedumpt
- Vaak beschadiging van het geotextiel
 - ➔ geen filter functie dus schade
- IJsseloo

Andere schade

- Geotextiel tegen stenen gedrukt.
- Egaliseren stenen door deze over geotextiel te trekken
- Grote belasting (kraan)



Geotextielen onder steenbekledingen

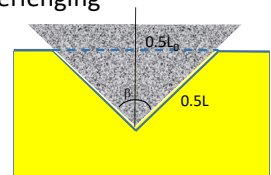


Geotextielen onder steenbekledingen

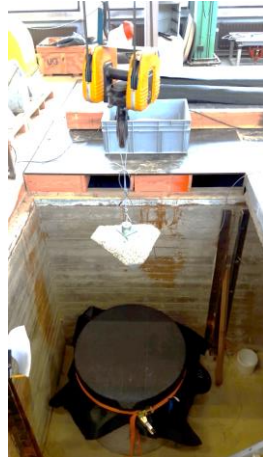
Conclusies:

- Gebruik vliezen ipv weefsels (grotere max. rek vliezen)
- De 'scherpte' van de steen is van belang
Kleinere β geeft meer verlenging

$$\epsilon_l = \frac{1}{\sin(0.5\beta)} - 1$$



Impact tests



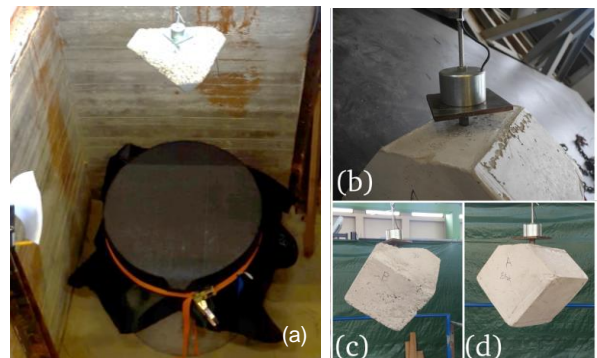
Impact tests



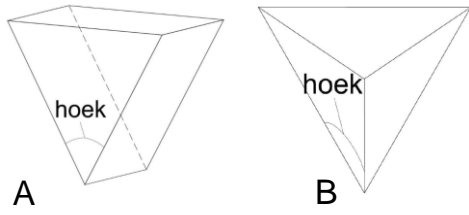
Impact tests BAW



Impact tests, Ghent

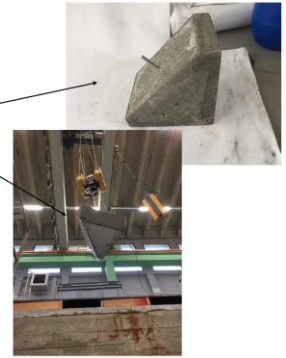


Type blokken

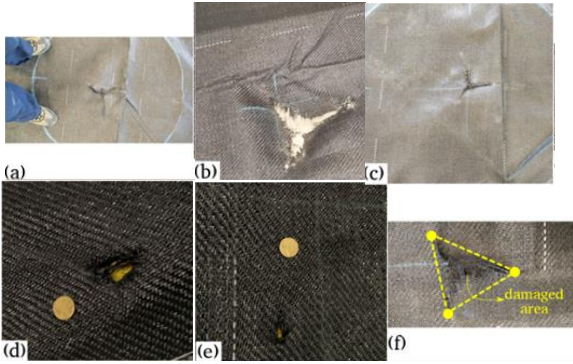


Blocks

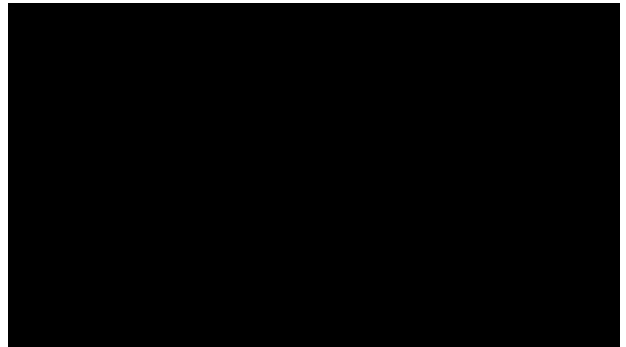
- Shape :
 - Block A : Triangular prism
 - Block B : Triangular-based pyramid
- Mass :
 - Around 40 kg
- Angles :
 - Block A : 60° , 90° , 120°
 - Block B : 60° , 75° , 90°



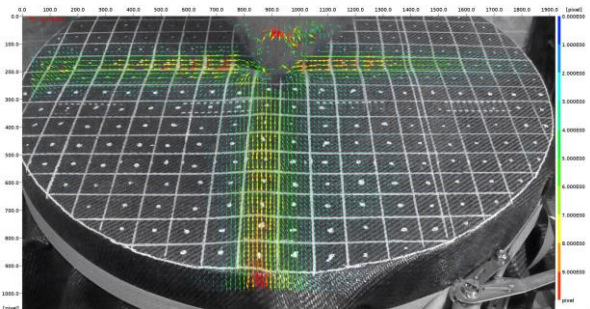
Schade patronen



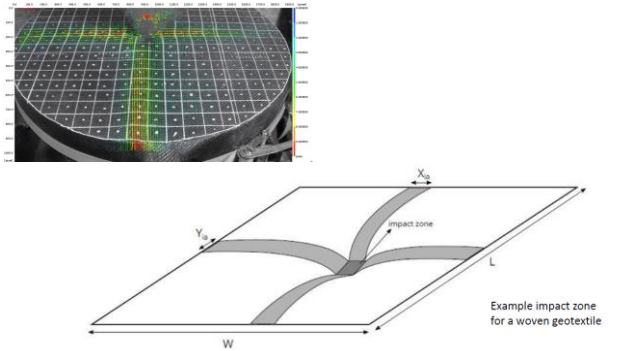
Slow motion



Woven geotextile

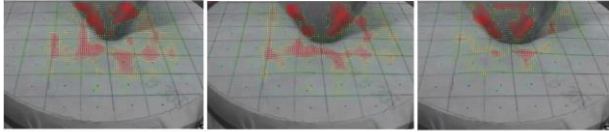


Woven geotextile



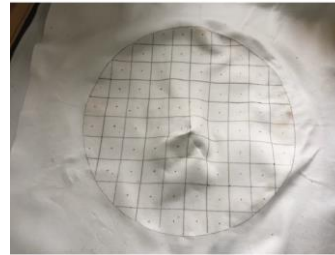
Non woven

• R301 – B60 – 3,00 m → PIV-analyse



Non woven

• R601 – B90 – 4,00 m



Block B 90 degrees

Non woven

• R301 – B60 – 3,00 m



Block B 60 degrees

Blok A
op 2 m



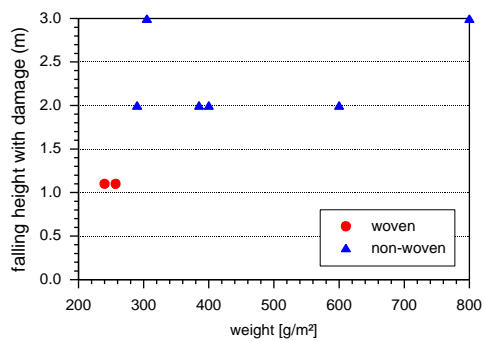
Blok A
op 3 m



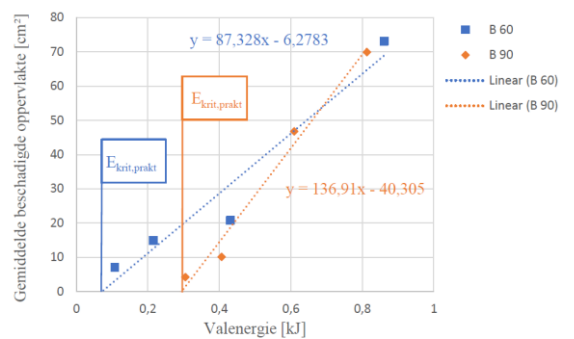
Blok B
op 3 m



Block B (point 90 degrees)



Critical height / drop energy

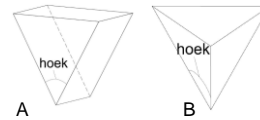


Woven/Non-woven

Parameter	Woven geotextile A	Non-woven geotextile B
Weight	347 gr/m ²	300 gr/m ²
tensile strength (avg)	81.4 kN/m	17.5 kN/m
ultimate strain (avg)	8.40%	50%
absorption energy	4.9 kJ/m ²	4.4 kJ/m ²
impact energy at damage (with block B90)	0.3 kJ	2.1 KJ
critical drop height	0.74 m	5.4 m

Influence stone angle drop height

Block	Woven	Non-woven
A60	3.8	3.41
A90	4.5	-
B60	0.17	0.31
B90	0.72	5.25



Woven + Non-woven



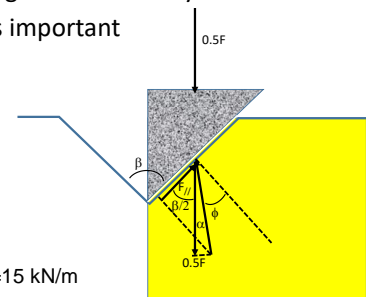
- Woven 55 kN/m max elongation 15%
- Non-woven 15 kN/m max elongation 50%
- Drop height 1 m



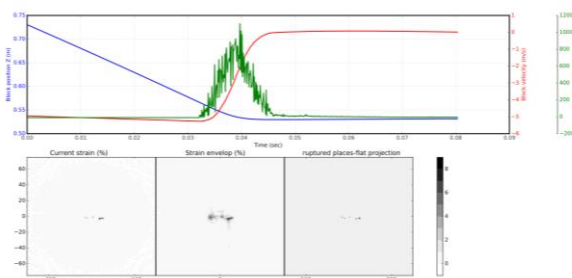
Combination: always lowest one is damaged

Woven + Non-woven

- Does not fit in geometric theory.
- Friction seems important



Result simulation



Conclusions:

- Apart from impact energy, the shape of the block is very important
- Wovens are loaded in the 2 directions of the yarns
- Non wovens have a more circular deformation pattern
- The 3-D deformation is important also for Block A
- Sharp stones also penetrate non-wovens
- Friction with subsoil also seems important