

Quality aspects of geosynthetics used in road constructions



NorGeoSpec system



Euroopa Liit
Euroopa
Regionaalarengu Fond

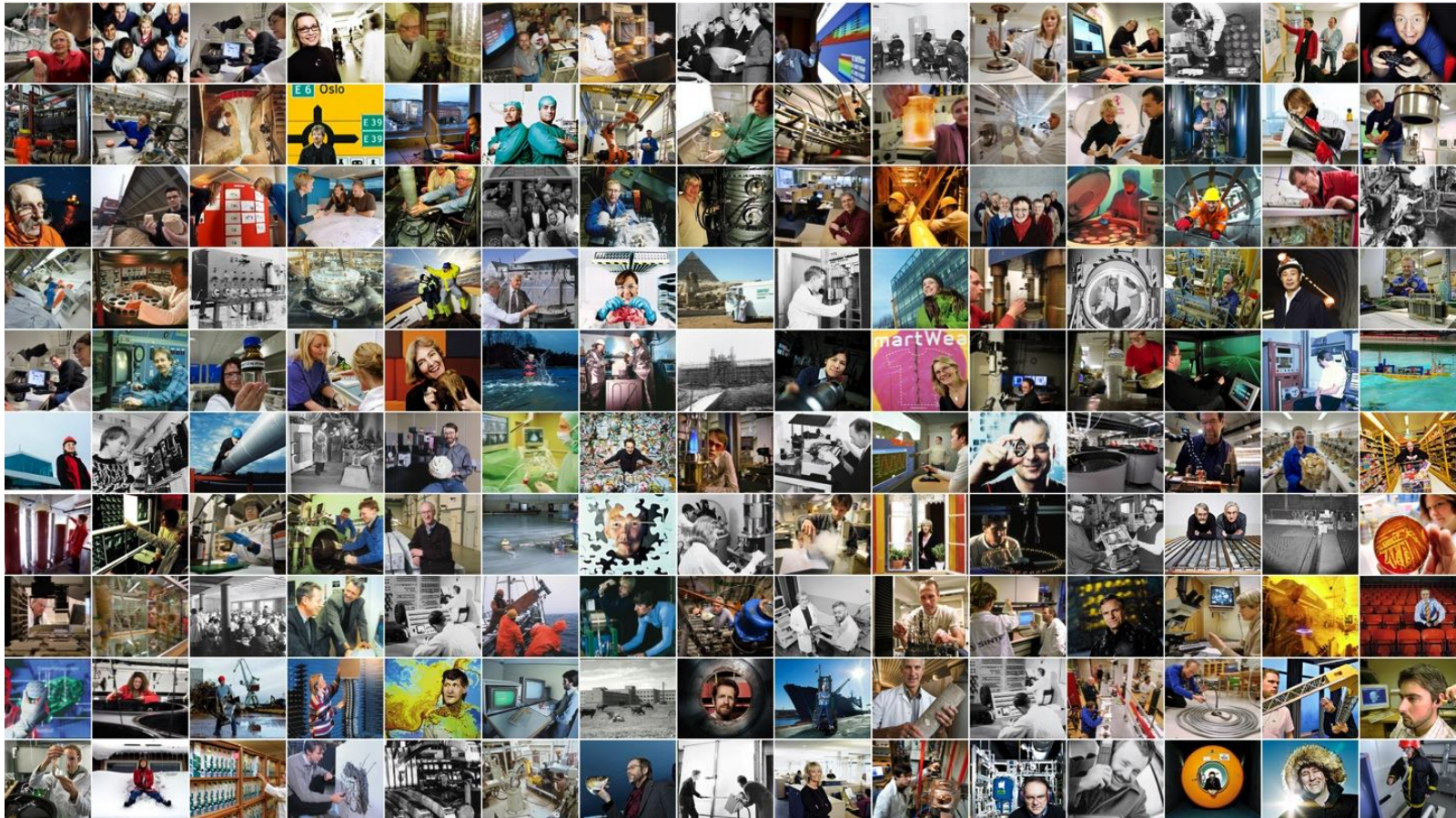


Eesti tuleviku heaks

Dipl.-Ing. Christian Recker



SINTEF

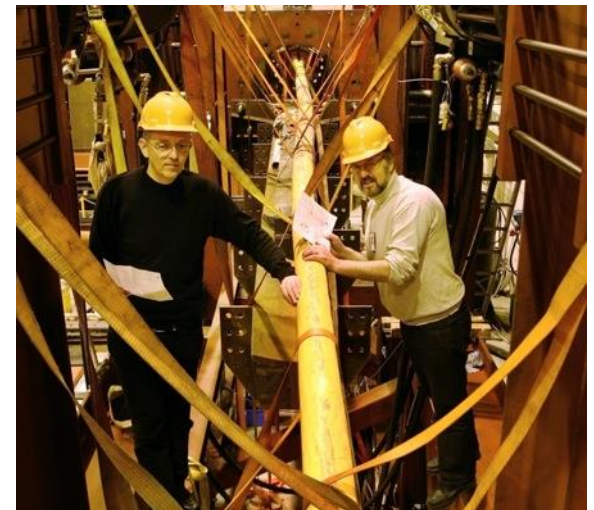


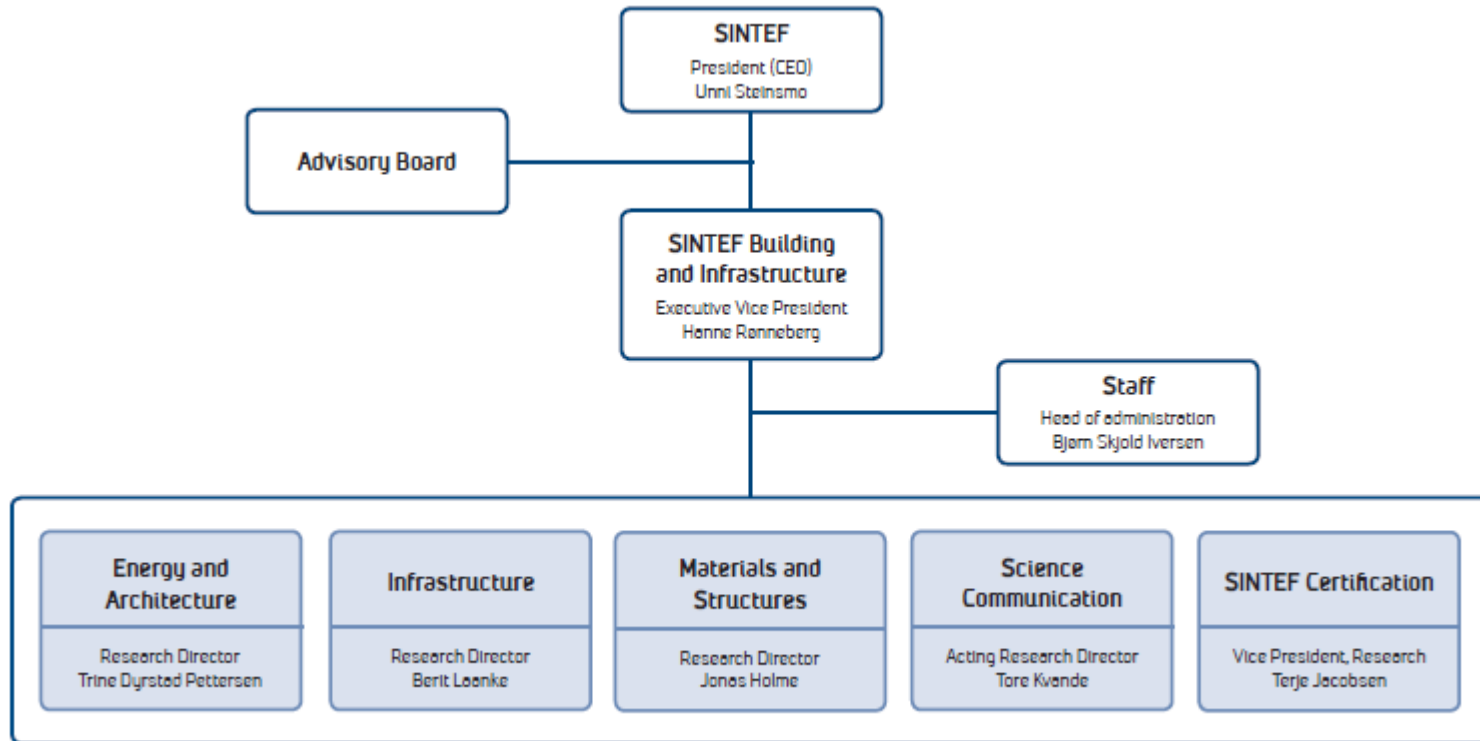
Technology for a better society



SINTEF is the largest independent research organisation in Scandinavia

- Leading expertise in the natural sciences and technology, environment, health and social science
- 2100 employees from 67 countries
- Customers in 60 countries
- A non-commercial research foundation with subsidiaries

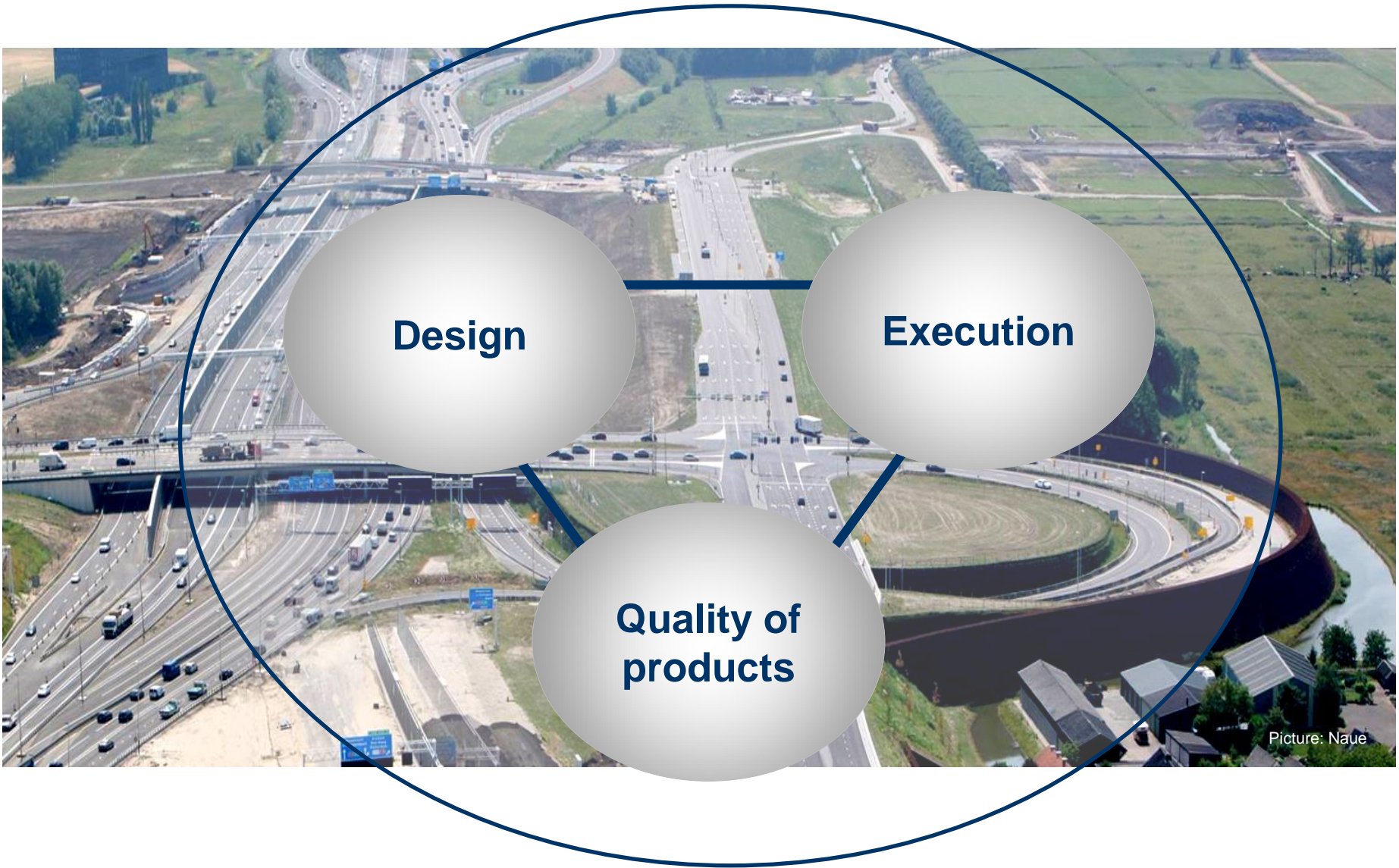




- Road and Railway
- Geotechnical
- Water and Environment
- Rock and Soil Mechanics
- Coast and Harbor

Notified Body ID no: **1071**





Picture: Naue

NorGeoSpec 2012



Nordic system for certification and
specification of geosynthetics



CE marking: a passport for the products in Europe



- a legal obligation:
Without CE Marking, a product can't be placed on the market in the countries members of the European Union and in Norway, Islande and Liechtenstein.

CE marking

- CE is a producer declaration of conformity
- The producer defines the tolerances for the different tests required
- The producer is allowed to perform all necessary tests in his laboratory
- It is based on
 - Product testing
 - Certification of the factory production control (Notified body)
- After the certification the notified body gives the producer the right to put up the CE-sign onto the product onto the product

It is not a product certification

It is not a quality mark !!



CE marking



Examples: CE mark products failed in an external surveillance

NorGeoSpec is a Nordic system for specification and control of geotextiles in roads and other trafficked areas

Supported by public road authorities in

- Finland
- Sweden
- Norway
- Island



Relevant application standard:

EN 13249 (Roads and other trafficked areas)

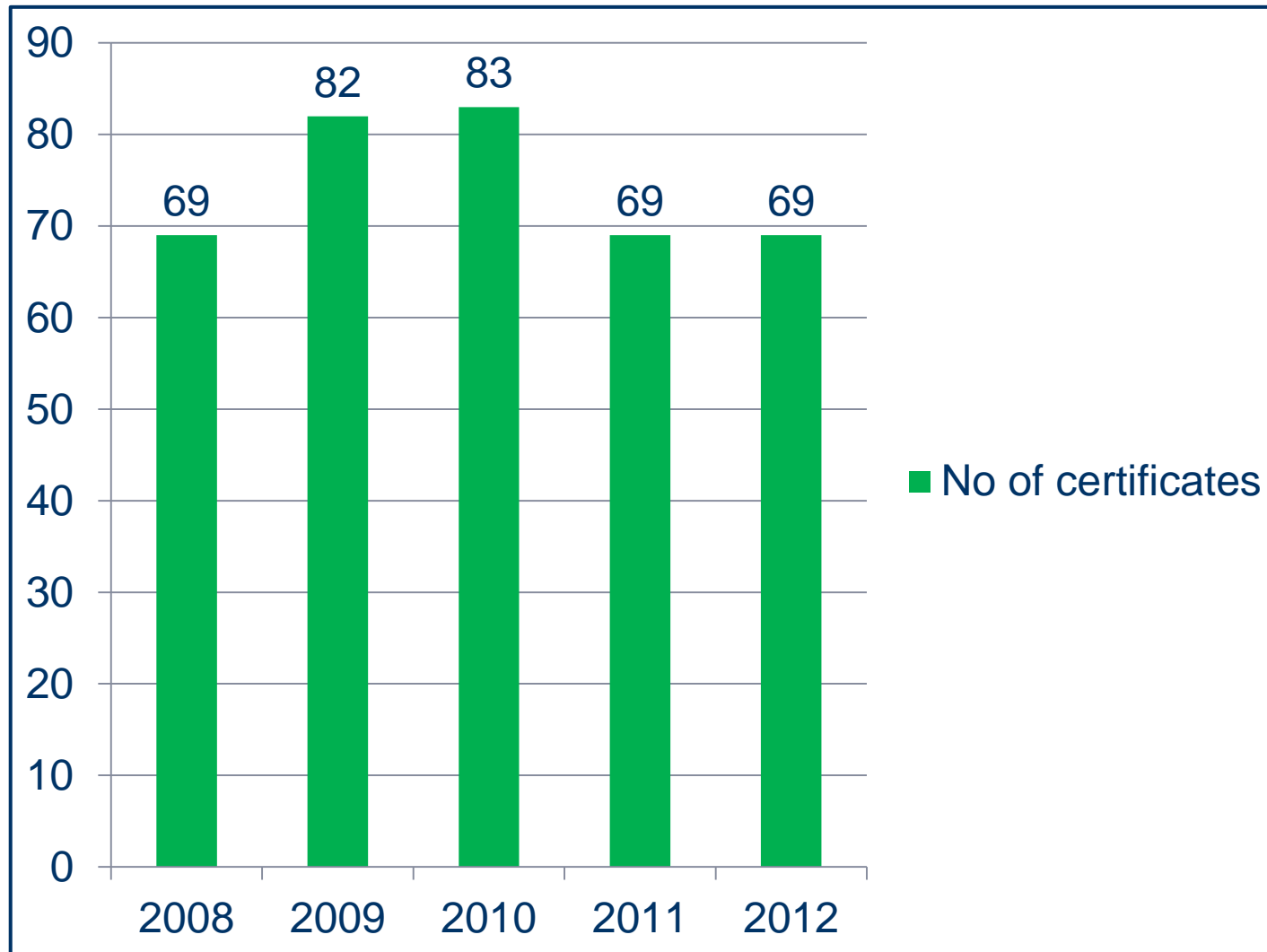
Function:

Separation and filtration in roads

Durability:

max. 25 years

Geosynthetics certified according to NorGeoSpec 2002



Function: separation and filtration



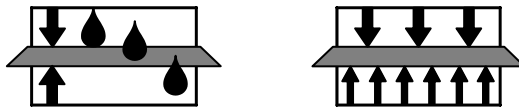
Function: Reinforcement

A Nordic system for certification and specification of geotextiles and geotextile-related products

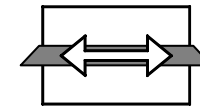
Function:



Filtration and separation



Reinforcement



Durability: 25 years and > 25 years

Relevant application standard:

NorGeoSpec 2002



EN 13249



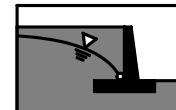
NorGeoSpec 2012



EN 13250



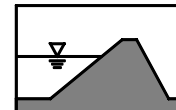
EN 13251



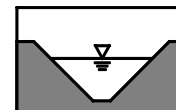
EN 13252



EN 13253



EN 13254



EN 13255



EN 13256



EN 13257



EN 13265

EN 15381

NorGeoSpec: certification + classification process

A two-stage product-certification procedure is used when deciding whether geotextiles and geotextile-related products comply with the requirements of NorGeoSpec.

Stage I = Certification separation + filtration, reinforcement



Stage II = Specification separation + filtration,
sealing?, protection?, drainage?

Stage I procedure is obligatory and must in all cases precede any stage II procedure.

Stage II procedure is obligatory for function separation and filtration

NorGeoSpec 2012: Stage I certification procedure

- **Initial inspection of the production**

- Factory production control
- Product sampling



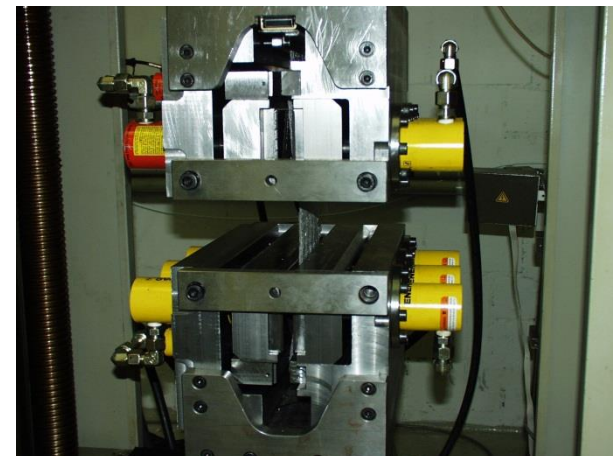
Product sampling

- **Initial type testing**

- Testing in an NorGeoSpec accredited laboratory

- **Yearly random product sampling and testing**

- production
- on side



Product testing: tensile strength

NorGeoSpec 2012: Stage I certification

Table 1: Certified values with tolerance (in % of values) depending on the function fulfilled by the product

Characteristic	Standard	Unit	Function		
			Filtration	Separation	Reinforcement
Mass per unit area	EN ISO 9864	g/m ²	± 10 %	± 10 %	± 10 %
Dimensions	-- ¹⁾	mm	n.r.	n.r.	± 10 %
Mechanical tests					
Tensile strength	EN ISO 10319 ²⁾	kN/m	-10 %	-10 %	-5 %
Elongation at max. load	EN ISO 10319	%	-20 %	-20 %	± 20 %
Strength at 2, 5, 10% strain	EN ISO 10319	kN/m	---	---	-20 %
Static puncture test	EN ISO 12236	kN	-10 %	-10 %	n.r.
Dynamic perforation resistance	EN ISO 13433	mm	+25 %	+25 %	n.r.
Hydraulic tests					
Permeability normal to the plane without load	EN ISO 11058	mm/s	-30 %	-30 %	-30 % ³⁾
Characteristic opening size	EN 12956	µm	±30 %	±30 %	n.r.

¹⁾ Applicable only for geogrids (definition acc. EN ISO 10318). Test procedure see Annex I: Test procedure-dimensions of geogrids .

²⁾ MD and CMD direction. For uniaxial products, test only the direction of load uptake

³⁾ Voluntary

n.r. = not required

NorGeoSpec: Stage II – specification (separation and filtration)

Table 1: Required values – Product Quality Classification

Function: separation and filtration							
Characteristic	Unit	Maximum tolerance ¹⁾	Required ²⁾ values corresponding to 95% confidence limit				
			Specification profiles				
			1	2	3	4	5
Min. tensile strength	kN/m	-10%	6	10	15	20	26
Min. tensile strain at max. load	%	-20%	15	20	25	30	35
Max. cone drop diameter	mm	+25%	42	36	27	21	12
Min. energy index	kN/m		1.2	2.1	3.2	4.5	6.5
Min. velocity index	10 ⁻³ m/s	-30%	3	3	3	3	3
Max. char. Opening size, O90	mm	±30%	0.2	0.2	0.2	0.15	0.15
Max. tolerance for mass per unit area			±12%	±12%	±10%	±10%	±10%
Max. tolerance for static puncture strength			-10%				

¹⁾ The tolerance shall be stated by the manufacturer, this table gives the maximum allowable tolerance in the accompanying document to the CE-mark

²⁾ The tolerances are not to be added to the required values. The nominal values ± the tolerance shall fulfill the requirement.

Annex B (Durability aspects) : EN13249 - EN13257 and EN13265

A system for ensuring **a minimum level of durability for standard polymers** in a normal soil environment by means of simple index tests

NorGeoSpec 2012

An estimate of the product lifetime for the **foreseen function** must be provided (performance assessment)

- Define material
- Define environmental
- Define failure
- Identify degradation mechanism (s)
- **Predict lifetime (e.g. 50a or 100a)**

Performance tests

Table 3: Performance tests

Characteristic	Standard	Requirements
Resistance to weathering	EN 12224	RF _W
chemical resistance	EN 12447 EN 13438 EN 14030	RF _{CH}
Tensile creep and creep rupture	EN 13431	RF _{CR}
Damage during installation	Annex J	RF _{ID}
Direct shear test	EN ISO 12957	Manufacturer declaration

RF_W = reduction factor for weathering,

RF_{CH} = reduction factor for environmental effects

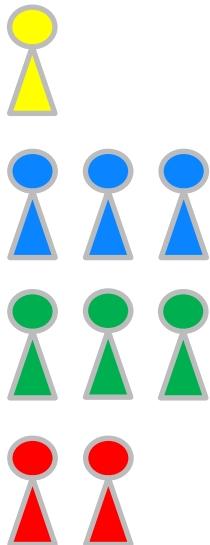
RF_{CR} = reduction factor for creep-rupture

RF_{ID} = reduction factor for installation damage



Technical Committee: Representatives from

- transport administration: Sweden, Finland, Norway (Blue)
- NorGeoSpec Certification Body (Yellow)
- the laboratories involved in the NorGeoSpec system (Red)



Advisory Board: members

- Technical Committee
- Representatives from the manufacturers¹⁾
- Representatives from the Laboratories

¹⁾ nominated by the EAGM
part of the NorGeoSpec system

Responsibilities: Technical Committee (TC)

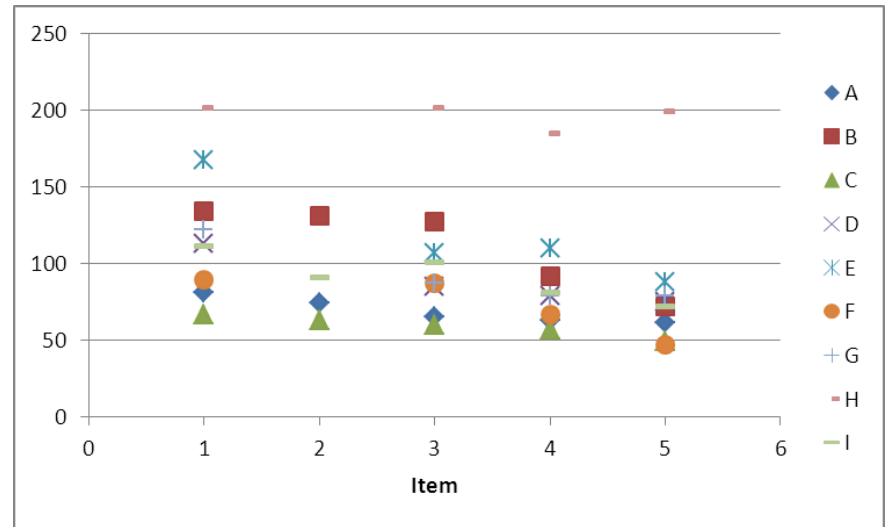
- examining files, inspection reports and laboratory test reports which are presented by the NCB
- recommending decisions for the certification of single products

Responsibilities: Advisory Board (AB)

- contribution to drawing up and revising the NorGeoSpec document
- proposing the strategic evolution and supporting the promotion of the system
- ensuring that the NorGeoSpec document is harmonized to European and national regulations
- helping to solve any conflicts out of court between involved parties by setting up Working Groups if necessary.
- Proposing experts for accreditation

Opening Size Test Results (EN ISO 12956)

Lab	Item 1	Item 2	Item 3	Item 4	Item 5
A	81	74	65	63	61
B	134	131	127	92	72
C	67	63	60	57	49
D	113		85	79	75
E	167		107	110	88
F	89		87	67	47
G	122		87	79	79
H	201		201	185	199
I	111	91	101	81	72
Min	67	63	60	57	49
Max	201	131	201	185	199



- Different quality certification systems (Asqual, NorGeo,...) accept a tolerance of +/- 30%.

When the lab variation is higher (like in this case >70%) it will create problems even for high quality manufacturers.

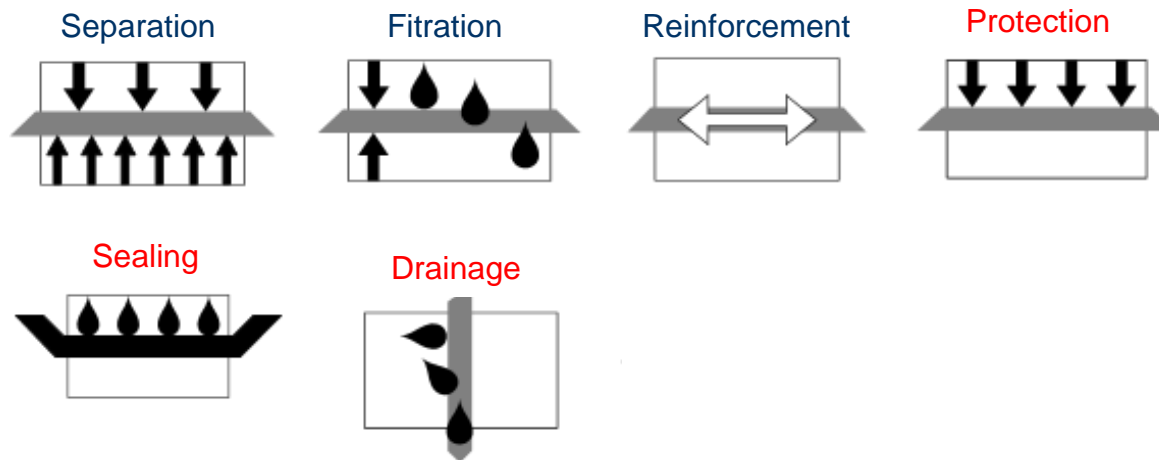
Requirements

The laboratories shall fulfil the following requirements:

- the laboratory shall have an accreditation according to EN ISO 17025 covering the test performed
- the laboratory is independent and impartial (not owned by a manufacturer of geosynthetics or by a holding company which also owns such a manufacturer)
- **the laboratory is independent of the NorGeoSpec Certification Body (not owned by the same company or by the same holding company)**
- **the laboratory participates in the programme of continuous improvement of testing quality organised by the NCB (Quality Label)**

A Nordic system for certification and specification of geotextiles and geotextile-related products

Function:



Drainage, sealing and protection (end of 2014)



Push the product quality by assigning
products with NorGeoSpec quality label

End



In

- design,**
 - construction execution**
 - product quality**
- we trust!**

Questions?