Geosynthetics certification through Europe

H. Zanzinger
LGA, Geosynthetics Institute, Nuremberg, Germany

Keywords: Certification, Geotextiles, Quality assurance, Quality control, Regulations

ABSTRACT: In the past there were different standards on Geosynthetics (GSY) in different European countries. Nowadays we have common European standards and only a few additional national standards on GSYs. As this is a very good development for the European market for the manufacturers and for the users, we still have different national certification programs. The paper gives an overview of the actual certifications through Europe, suitability tests for products and quality on the construction site. The requirements and the assessment procedures are compared. New activities on a common European certification are presented.

Introduction

In the past, there were different test methods, different certification programs and also different classification systems for geosynthetics all over Europe. Manufacturers and suppliers of geosynthetics had to test their products according to several similar test procedures.

By the standardisation work within Europe carried out by CEN TC 189 a number of test methods were issued during the past years. The approach in this field has been very successful. The CEN product standards are targeted for completition in 2000. The CE marking for geosynthetics will start in year 2001 provided they fulfil the requirements of the Construction Products Directive (CPD). However, the CE mark will only demonstrate that the product meets the minimum legal requirements necessary to be placed on the European market. The CE mark is not intended to be a quality certification nor the demonstration of the suitability for the performance of a product in a given application.

Furthermore, the decision in CEN TC 189 has been taken, that no European classification system of geosynthetics shall be introduced. Each European country is free to produce its own classification system.

For geosynthetics, the European Community has set the system 2+ as the system of attestation of conformity. System 2+ requires only factory production control (FPC), initial type testing and a certification of FPC by a notified body. There are no random audit tests of samples by a third party. CE marking is a significant step forward in the assessment of geosynthetics, but we are still going to have national regulations for geosynthetic applications in each individual European member state. There will be more certification programs in the future than before, at the present time they are just being introduced and it is asked for notification faster than ever. The manufacturer who wants to sell his products in several European countries will be audited by more and more certification bodies.

The question arises if an encompassing approach to certification could be established for geosynthetics in Europe. A system ought to be developed for one-by-one certification of properties. In such a system all tests, all certifications of results and all manufacturing routines have to be conducted only once. So the costs for the manufacturers could be minimised.

Such an approach in geosynthetics certification cannot be solved from national points of view by adapting one national system. The other members will rarely be convinced to accept a system practised in one country so far. The work will be done by an European board or institution who evalu-

ates similarities and differences of existing national certification systems. The well-tried parts of the individual systems will be adapted to form the basis of an European geosynthetics certification system (EGCS). The first goal of the European Association of Geosynthetic Manufacturers (EAGM) is an European certification program for geosynthetics.
At the moment we have different quality levels in different countries for different applications. We talk about product certification, about classification, about recommendations, about requirements and about technical approvals or assessments. There is a need of harmonisation of these systems, because of the translation of the terminology and the different interpretation in practise it is hard for all involved persons, to get an overview over the different systems in Europe.
The actual practice in the individual countries and also in the different applications is very different. In some countries there are nearly no quality checks on site in other countries there are a lot. In some countries there is a lot of manufacturing quality assurance (MQA) by third parties, but in other countries there are no MQA required.
The ”umbrella” for an European certification system is under construction. Manufacturers, laboratories and also the European ministries have to be involved. It is necessary for the wide spread acceptance of this certification system, that all participants promote the system in all European countries.
The benefits of the system will be, that manufacturers do not have to test their products in each European country in special national laboratories. The "multiple tests" will decrease but a few appropriate tests will increase. The manufacturers do not need a special certification for each European country by a national certification body. The manufacturers save time when they introduce their products on new markets. The products will be checked on the same quality level. The quality level will increase. Trade barriers will disappear.

Geosynthetic Standards

The standards can be divided in test standards, requirement standards, quality standards, installation standards and design standards. The responsibilities for the standards lie at International Standardisation Organisation (ISO), European committee for standardisation (CEN, Comité Européen de Normalisation) and national standardisation bodies.

1.1 *Standardisation bodies*

1.1.1 *National standardisation bodies*

The major countries have a national standardisation body, which develops standards on testing, requirements, installation and/or design (e.g. Austria - ÖN, China - GB, France - AFNOR, Germany - DIN, Italy - UNI, Spain - AENOR, UK - BSI, USA - ASTM, etc.). Generally these standards are developed depending on the local situation with local interest in mind. These are often different from one country to another, which makes the comparison of test standards and product performances very difficult. For this reason international standardisation work has been organised in ISO and in CEN.

1.1.2 *ISO standardisation body*

The major countries are members of ISO. They are represented by their national standardisation bodies. Countries may be "P" members (voting members) or "O" members (observers). When a standard is voted, the countries normally use the ISO standard which replaces the national standard, but the application of ISO standard is not obligatory, and a country which votes against an ISO standard may keep its national standard.
Nevertheless as ISO standards are the result of a broad consensus between a lot of countries, they have a lot of acceptance around the world and are considered as the common basis for testing. In this respect if a standard does not exist in a country, the respective ISO standard should

be considered in preference to any national standard (ASTM, BS, DIN, etc.).

1.1.3 *CEN standardisation body*

CEN standardisation involves all the European countries. The standardisation covers testing, requirements, installation and design. All countries of the EU and EFTA are voting members. When a standard is voted, all the countries must adopt it and withdraw existing standards in conflict with the new standard.
The relationship between ISO and CEN is the "Vienna agreement". For testing standards, following the "Vienna agreement", parallel voting may be organised between ISO and CEN. When it is accepted after the formal vote, the standard number is EN ISO xxxxx. The same rules apply. In ISO the application is not obligatory. In CEN the European countries must adopt it.

1.2 *ISO standardisation*

The ISO standards are devoted to testing. Technical committee (TC) 221 ”geosynthetics” covers testing standards for geosynthetics. Five working groups (WG) are devoted to different types of standards and to liaison with the CEN TC 189.

ISO TC 221 - Chairman: André Rollin - Secretariat: BSI

WG 1 Liaison with CEN TC 189
WG 2 Standards on terminology, identification and sampling
WG 3 Standards on testing of mechanical properties
WG 4 Standards on testing of hydraulic properties
WG 5 Standards on testing of durability properties

1.3 *CEN standardisation*

The countries involved in CEN work are: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, The Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom. Geosynthetics are covered by the technical committee CEN TC 189 ”geosynthetics” which is one of the technical committees in building and civil engineering.
The work on geosynthetics is covered by the CPD. The CPD defines the essential requirements for the construction products. The European commission defines mandates whose goal is to define the performance required to ensure that the essential requirements are fulfilled. The conformity of the product to the CPD is shown by the CE marking. CE marking is obligatory to place any product on the European market. CEN TC 189 is organised into six working groups:

CEN TC 189 - Chairman: Gert den Hoedt - Secretariat: IBN

	Subject	Convenor
WG1	Requirements	Philippe Delmas (France)
WG2	Terminology	Helmut Zanzinger (Germany)
WG3	Mechanical tests	Daniele Cazzuffi (Italy)
WG4	Hydraulic tests	Bernard Myles (UK)
WG5	Durability	John Greenwood (UK)
WG6	GMB and GCL	N.N.

Tests standards have been published by CEN. They may be either EN (European standards), ENV (European experimental standards) or EN ISO (European and ISO standards). When in process of voting the draft is named prEN or prEN ISO. Working Group 6 has been created to co-ordinate the work on geomembranes (GMB) and geosynthetic clay liners (GCL) and to split the work between the TC 189 and TC 254. CEN TC 288 WG9 (chairman:

T. Ingold) is working on "reinforced fill", in which geosynthetic reinforcement is included. TC 250 SC7 is working on the EUROCODE: design approaches, factors of safety, minimum soil characteristics, general rules, etc.. Parallel meetings of CEN TC 189 are regularly organised with ISO TC 221 ”geosynthetics” and parallel voting is launched, when agreed, following the "Vienna agreement".

1.4 *European test standards*

These allow the measurement of one or several characteristics of the product and can be grouped as index standards, used for identification and characterisation of the product and performance tests, generally used for evaluating the performance in contact with soil or for long-term behaviour. They may be developed either at the national level, at the European level (CEN standards) or at the international level (ISO standards)

Table 1. Identification test standards.

Test method	Property
EN ISO 10320	Identification on site
EN 963	Sampling and preparation of test specimens
EN 965	Mass per unit area
EN 964-1	Thickness at specified pressures part 1: single layers
EN ISO 9863-2	Thickness at specified pressures part 2: multi-layer products

Table 2. Hydraulic test standards.

Test method	Property
EN ISO 11058	Water permeability characteristics normal to the plane, without load
EN ISO 12956	Characteristic opening size
EN ISO 12958	Water flow capacity in their plane
EN 13562	Resistance to water penetration

Table 3. Mechanical test standards.

Test method	Property
EN ISO 10319	Wide-width tensile test
EN ISO 10321	Tensile test for joints/seams by wide-width method
EN ISO 12236	Static puncture test (CBR-Test)
EN 918	Dynamic perforation test (Cone drop test)
ENV ISO 10722-1	Damage during installation test part 1: installation in granular materials
prEN ISO 12957-1	Friction test (direct shear)
prEN ISO 12957-2	Friction test (inclined plane)
prEN 13738	Pullout test
EN ISO 13431	Tensile creep and creep rupture behaviour test
ENV 1897	Compressive creep test
EN ISO 13427	Abrasion damage simulation (sliding block test)
prEN 13719	Long term protection efficiency test

Table 4. Durability test standards.

Test method	Property
ENV 12224	Resistance to weathering (UV resistance)
ENV ISO 12960	Resistance to chemical degradation
ENV 12447	Resistance to hydrolysis
prENV 13438 rev.	Resistance to oxidation (thermal oxidation)
ENV 12225	Resistance to micro-biological degradation (soil burial test)
ENV 12226	General tests for evaluation following durability testing
EN ISO 13437	Method for installing and extracting samples in soil and testing specimen in laboratory

Some work items are under study in CEN TC 189: e.g. work item 7 ”terms and their definitions”, work item 26 ”water permeability normal to their plane under load” and work item 70 ”product control of products delivered on site”.

1.5 *Requirement standards*

These define the requirements for geosynthetics in different applications. These standards are mainly developed at the European level; in this case these standards include the requirements imposed by the CE marking.
The EN requirement standards allow manufacturers to describe GSYs on the basis of declared values for characteristics relevant to the intended use and if tested to the specified method. It also includes procedures for the evaluation of conformity and factory production control. They may also be used by designers, end-users and other interested parties to define which functions and conditions of use are relevant.
The European requirement standard include annexes prepared under mandate M/107 ”geotextiles” given to CEN by the European Commission and the European Free Trade Association (EFTA), given under the EU CPD (89/106/EEC). The requirements linked to the CE marking are described. For geotextiles and geotextile related-products the requirement standards will be launched for formal voting within year 2000.

Table 5. Required characteristics for geotextiles and geotextile related products (GTX and GTP).

Test method	Usage
prEN 13249	Construction of roads and other trafficked areas
prEN 13250	Construction of railways
prEN 13251	Earthworks, foundations and retaining structures
prEN 13252	Drainage systems
prEN 13253	External erosion control systems
prEN 13254	Construction of reservoirs and dams
prEN 13255	Construction of canals
prEN 13256	Construction of tunnels and underground structures
prEN 13257	Solid waste disposals
prEN 13265	Liquid waste containment projects

Table 6. Required characteristics for geomembranes and geosynthetic clay liners (GMB and GCL).

Test method	Usage
prEN 13361	Construction of reservoirs and dams
prEN 13362	Construction of canals
prEN 13491	Tunnels and underground structures
prEN 13492	Construction of liquid waste disposal sites or transfer stations
prEN 13493	Solid waste storages and waste disposal sites

1.6 *Quality standards*

Standards on quality may be developed on a voluntary basis. At present, there is no action at the CEN level. Note that an action has been instigated by the EAGM, to create an international quality mark

1.7 *Installation standards*

These define the procedures for installing the products on site. At the present time, as regards geosynthetics, only one working group deals with installation in the area of reinforced structures (CEN TC 288 WG9).

1.8 *Design standards*

At the present time guidelines have been written for geotechnics in the framework of the CEN TC 250 SC7 EUROCODE.

Certification Systems

1.9 *Quality management system*

A quality management system according to ISO 9000ff of a producer is defined and verified by an external accredited certification body. This means, that the producer has defined his procedures and follows them. It does not mean, that the product quality is high.
The new ISO 9001 standard will be published in 2000. The standard could include the finished product, the production and the design. Within this certification the external certification body will not do tests.

1.10 *CE-certification*

Within the framework of the construction of Europe, certain national regulations of the member states have been harmonised on the basis of the European directives. For construction products the corresponding directive defines the essential requirements the products shall fulfil to be allowed to be placed on the European market.
The essential requirements are mechanical resistance and stability safety in case of fire hygiene, health and the environment safety in use energy economy and heat retention.
Compliance with these requirements is compulsory in order to permit the placing on the market and the free movement of regulated goods within Europe, irrespective of their origin. The mark which enables the inspection authorities of the different EU member states to verify that the products placed on the European market are presumed to conform to these European regulations is the CE Marking. CE means evaluation of conformity.
The manufacturer himself generally affixes CE marking. However, for certain products, depending on the nature of the risk, the directives impose a third-party inspection and proof of conformity (initial tests and examinations, production control, controlled quality assurance) issued by competent, recognised and authorised notified bodies (NB). Focussed principally on the safety-related aspects of products, the CE Marking can, of course, co-exist with quality certification marks.
For GSYs the level chosen for attestation of conformity is level 2+. The assignation of evaluation of conformity task is for the manufacturer the

factory production control (FPC) and the initial type testing and for the NB the certification of FPC on the basis of initial inspection of factory and of the FPC, continuous surveillance, assessment and approval of the FPC. FPC includes the manufacturing quality control (MQC) and a quality management system according ISO 9000ff. If it is necessary to check the product, the procedure for evaluation of conformity is described in the standards.
The manufacturer or his authorised representative established within the EEA is responsible for the affixing of the CE marking. The CE conformity symbol to affix shall be in accordance with Directive 93/68/EC. The affixing of the label will be done on the packaging of the GSY.
The procedure of assessing the FPC of the manufacturer is not based on testing of the products by a third party. Even the initial type testing will be done by the manufacturer. The question is, might it not be useful to require at least once test results from an independent accredited laboratory? Then the NB could check whether the MQC results are roughly correct or not.
The CE marking is not sufficient to prove the quality of a product, because the CE marking shows that for all the required properties of the considered product the values (average value and standard deviation) are correct and controlled. However it does not indicate if the product has the minimum quality level required for a typical application. E.g. in a filtration system the characteristic opening size O_{90} is one of the required characteristics. The need in this example is 100 µm. Two products are proposed: Product A with a O_{90} of 100 µm and a standard deviation of +/- 60% and product B with a O_{90} of 100 µm too but with a standard deviation of +/- 30%. Regarding to the CE marking, both products are controlled and correct, but it is clear that the uniformity of product B is better that the product A. The role of a product certification system is to fix the maximum variation of the characteristics. Therefore a CE mark is not a quality mark. It is more or less the ”passport” for the European market.

1.11 *National certification*

In several countries real product certifications exist for geotextiles (Table 7). The rules are written in national documents and the nominated and approved national certification bodies have normally an accreditation according to EN 45011. In principal these product certifications are voluntary, but in fact they have a very strong position in some of these markets.
The procedures are detailed in the documents. A third party control is installed. An auditor takes on behalf of the certification body randomly samples from the stock of the producers and sends these samples to independent accredited laboratories for testing. If the test results of the samples fall within the requirements (tolerances or minimum values), the product is approved for a certain period.

Table 7. National product certification systems for geotextiles.

Country	Document	Assessment body	Application
Belgium	CVG	COPRO	Roads
France	CDQP	ASQUAL	Roads
Netherlands	BRL-K553/01	KIWA	Roads
Netherlands	BRL-1131 BRL-1132 BRL-1133 BRL-1134 BRL-1135 BRL-1136	KOMO	Landfills
Switzerland	Produktekata-log	SVG	Roads

1.12 *European certification*

In the future we will have an European product certification system with an European quality mark. This system will work on a voluntary basis, but with the strong support of the EAGM and also of responsible certification bodies as well as testing laboratories.
The aim is to achieve the same quality level for all products. The quality of the product is verified by an external body (certification body). This means that the quality system of the producer is verified (generally acc. ISO 9003) and random samples of the product from the stock (or in situ) are regularly tested by external accredited laboratories. It means that the data sheet of the product is verified by an independent accredited body. The accreditation requirements of the laboratories are written in the standards EN 45001 respectively EN ISO 17025. The test labs have to show, that they perform reproducible results by there attendance in round robin tests.
The manufacturer is responsible for the test frequency, which must ensure, that the data sheet values are confirmed. The data sheet gives average values and 95% tolerance values (characteristic values) of the production. All tests, which have to be done, are defined in the product certification.
The samples have once a year to be taken from the stock of the producer by an auditor on behalf of a certification body. Each product grade of GTX has to be tested with all the defined tests at independent laboratories. The quality mark will be granted, if certain quality limits are fulfilled.

Suitability tests

For each project the appropriate suitability tests have to be undertaken. The required tests with the site specific test conditions have to be written in the specifications. Where available these tests are generally described in recommendations and classification documents or even in technical approval documents.
Suitability tests should not be done by the internal laboratory of the manufacturer even if it is an accredited laboratory or by a laboratory which works very close to the manufacturer in terms of dependence. The test have to be done by real independent laboratories, which have of course an accreditation for the specific tests.

1.13 *Recommendations*

Recommendations give support in the use of certain products and special applications as far as there is no national or international standard available. They have sometimes the character of a standard and therefore they are often used as the basis for specifications, if they describe the state of the art.
Recommendations could include product descriptions, application areas, test procedures, quality procedures, design methods, installation methods, case studies, etc..

1.14 *Classifications*

A classification system is useful for applications where no design method is available like for the function separation. Therefor most of the existing classification systems have been introduced because of this reason. The other applications need no classification as we can design the required properties. But even then a few classification systems have classes for filtration and drainage functions (Table 8). In CEN there are no classes defined for geosynthetics.
In other countries like e.g. Switzerland and also in Germany other systems exist for certain applications (German rail or waterway constructions), which can’t be named as classification system. They are named product catalogue and technical delivery condition.

Table 8. Classification systems for geosynthetics.

Country	Document	Application	Products	Properties
Austria	RVS	Separation	Nonwoven geotextiles	T_{max}, F_P, O_d, pyramid test
Austria	RVS	Filtration, drainage	Nonwoven geotextiles	T_{max}, F_P, O_d, ψ, O_{90}, θ, weathering, chemical
Finland	VTT	Separation, filtration	Nonwoven geotextiles	M_A, T_{max}, O_d, ψ, O_{90}
France	CFG	Separation	Nonwoven geotextiles	M_A, d, T_{max}, ε_{max}, punching, O_d, ψ, O_{90}, θ
Germany	TL Geotex	Separation	Geotextiles	M_A, T_{max} or F_P
Norway	PRA	Separation	Nonwoven geotextiles	F_P, O_d
Sweden	VÄG	Separation, filtration	Nonwoven geotextiles	M_A, T_{max}, O_d, ψ, O_{90}

1.15 *Technical Approvals*

Up to now the European Organisation for Technical Approvals (EOTA) do not deal with geosynthetics at the European level. But several national approval bodies for construction products issued national technical approvals. A technical approval consists typically of a product description, a clear description of the tests to be done in the FPC as well of the tests to be done in the MQA. It includes the valid suitability tests for the corresponding application and also the details in the construction quality assurance (CQA) including the installation methods.

Table 9. National technical approvals for geosynthetics.

Approval body	Application	Products
BBA (UK)	Reinforcement (R) for roads and bridges	Woven geotextiles (GTX-W), geogrids (GGR) and geocomposites (R-GCO)
DIBt (D)	Reinforcement of slopes	GGR
DIBt (D)	Single barrier in a landfill cover (class 1)	Geosynthetic clay liner (GCL)
BAM (D)	Basal liners in landfills	Thermoplastic elastomeric geomembranes (TE-GMB)
BAM (D)	Protection (P) layers for GMBs in landfills	P-GTX and P-GCO
ICITE (I)	Reinforcement for roads and bridges	GGR

The performance of the product in the intended use is verified by an external body (approval body). This means that the quality system of the producer has been verified and that the product performance matches the given application. But generally it does not cover quality control of the product.
A technical approval is useful and necessary in critical and complex applications with the necessity of a lot of knowledge in long-term behaviour of the products such as reinforcements and liners, e.g. for landfills. It is an assessment for long-term aspects. In Table 9 a few examples for existing technical approvals in certain countries are given.

Quality assurance on the construction site

1.16 *Construction supervision*

The quality assurance consists of a construction supervision and also of control checks. It is the contractor's responsibility to ensure the evaluation of conformity of the delivered product with the contract (the specification) and in addition with the site-conditions. He has to control handling and storage conditions and placing of the product on site. In certain cases a placing and extracting of samples on site are necessary to check the damage during installation or a placing of samples is useful for checking the behaviour in the long-term. For the evaluation of conformity it must be checked, that the information according EN ISO 10320 "identification on site" is fulfilled.

1.17 *Quality control checks on site*

Samples should be taken to determine the conformance to specifications at random from a shipment lot. The test frequency of the control checks depend on the availability of MQA results and on the importance of the geosynthetic elements in the construction. Actually there is not an uniform practice in the different national countries in Europe (Table 10). It depends from the safety standards. A high safety standard has to be requested for e.g. reinforcement applications where long-term strength is a significant parameter or for barrier applications in landfills where the long-term behaviour is of highest priority. Most of the other applications could be in the low safety standard category.

Table 10. Examples of sampling frequencies for control checks.

Country	Samples per m² surface covered by the product
Austria	1 sample per 20,000 m²
Switzerland	1 sample per 5,000 m² (for a delivery higher than 20,000 m²: 1 sample for each following 10,000 m²)
Germany	1 sample per 10,000 m², but minimum is 2 in total (for a delivery less than 10,000 m²)
France	1 sample per 5,000 m² (for high and medium safety standards) 1 sample per 50,000 m² (for low safety standards)
Norway	1 sample per 10,000 m², but minimum is 1 for a shipment lot >5,000 m²

Furthermore the amount of samples sampled on site depends on the certification system of the products, which has already be undertaken in beforehand. If there is no external testing by a third party, which takes samples from the stock in the factory by random, then the number of samples should be twice than the practice, which is described in Table 10.
The tests to be made are resulting from the specification, but it will be these tests, which are undertaken by the manufacturer in FPC, e.g. mass per unit area, thickness, tensile test, static puncture test, cone drop test, water permeability (flow rate without load), characteristic opening size, water flow capacity (axial flow) or water tightness. For these properties enough statistical data will be available to do statistics. The average values and the standard deviations are know over a sufficient production period.
Other tests like weathering tests or direct shear tests, which will be tested less often, perhaps once per year, do not allow any statistics.

Therefore these tests are not useful for quality control checks. They are more used as performance tests for specific projects under the appropriate conditions.
The evaluation of the specified properties can be done with certain characteristic values, which have to be seen as minimum values. In USA a minimum average roll value (MARV) is used, whereas in Europe we use a characteristic value (CV), which is different than MARV.

1.17.1 *Minimum average roll value*

The MARV is defined by the mean value and the tolerance corresponding to a confidence level of 97.5%. This means, that MARV is the mean value of a production for a certain period minus 2 times the standard deviations of the same period. For each roll, the average value obtained during a single control test shall be above the MARV. In this case the evaluation of conformity is realised.
A difficulty occurs when the design of the structure has to be performed at a different confidence level than 97.5%. (e.g. high retaining structures with 99% confidence level). In this case the knowledge of the MARV alone does not permit calculation of the 99% confidence level.

1.17.2 *Characteristic value*

The CV is typically used in Europe as a minimum value. It is defined by the mean value and the tolerance corresponding to a confidence level of 95%. For each roll, the average value obtained during a single control test shall be above the CV. In this case the evaluation of conformity is realised.

Summary

The standardisation in geosynthetics made a very good progress in the last years. European test standards are practically harmonised and the requirement standards will probably be published by the end of 2000. The certification in Europe is not as uniform as the standardisation of the GSYs. Still different national certification systems are in use.
The certification of the quality management system of a production is nowadays common practice. The forthcoming CE certification procedures follow mainly the requirements for quality management systems and define in addition the tests which the producer has to undertake in the MQC during production. But a CE mark is not a quality mark. So the CE mark will not replace product certification systems in the different countries.
For a comparable quality level in Europe and an European trade without restrictions an European quality mark is on the way. This European product certification system works on a voluntary basis and it could and should replace the existing national product certifications. In practice this will also be a harmonisation of certification systems.
Even when there are a lot of testing and supervision of the production of GSYs, a CQA with sampling on site is still needed. In the future this will be more important than ever, because of the fact that apart from so many quality discussions the users are more confused than ever. They believe that the products are under supervision of external bodies, but they forget that most of the quality systems do not check the quality of the product, but the quality management system and this is very different from a third party testing, which will check the quality of the product.

Acknowledgement

The author thanks the colleagues from CEN TC 189 and the EAGM for the support of this emphasis on certification systems for geosynthetics.