

CQA Requirements

Quality Control & Quality Assurance

Quality assurance is an important part of landfill construction, it is a vital component in providing confidence that all works have been carried out to the design specification.

The environment agency state that the following should be checked and documented by the CQA engineer:

- The product marking and the information affixed to the geotextile is in accordance with EN ISO 10320.
- The CE mark is affixed to each roll along with the accrediting bodies' number.
- The relevant CE declaration in line with EN 13257 is available, and the reported values and tolerances are in line with the requirements of the design specification.
- The conformance testing performed by the laboratory is performed in a laboratory that is UKAS accredited for each individual test.
- All conformance testing is correctly evaluated against the requirements of the design specification.



Independent Testing Laboratories

The Environment Agency require independent validation that products supplied to site be tested to ensure that they meet the functional design requirements, this will form a part of the overall CQA requirements for the site. Conformance testing must form part of the overall CQA. It is undertaken to provide confidence the geosynthetics installed at the site has the same properties as the specification agreed and that the agreed properties are consistent across the whole of the material.

CQA testing may only be undertaken at laboratories that have **UKAS accreditation** for the required tests. UKAS is appointed as the national accreditation body by Accreditation Regulations 2009 (SI No 3155/2009) and the EU Regulation (EC) 765/2008 and operates under a Memorandum of Understanding with the Government through BIS.

Accreditation is only given for **individual tests** so it is worth checking the laboratory has accreditations for all the tests you require, this can be checked at:

www.ukas.com

Alternatively, contact BTTG or BICS at

<https://www.bttg.co.uk/>

and

<https://www.bics-labs.com/>

BTTG and BICS are independent UKAS accredited testing laboratories and can conduct testing on most geosynthetic materials.

Product Packaging & Identification

Each roll of geotextile delivered to site must have a label complying with EN ISO 10320 affixed to it. The product label should detail the following:

- The manufacturer
- Product identification (batch & roll number)
- Roll dimensions (length & width)
- Roll weight (for handling purposes)
- Polymer type

In addition to this, rules relating to the CE marking of construction products now stipulate that the products are also required to have information on the label relating to the products DOP (Declaration of Performance).

All Geofabrics products are delivered to site in specialist packaging designed to protect the products from degradation caused by UV light. It is recommended that the materials be kept in their protective packaging until such a time that they are required for installation.

Where possible and appropriate, the materials are marked with their name along the edge of the material.

Conformance Testing

Conformance testing is required to demonstrate that the products that have been used within the design meet the specification, this forms part of the total CQA plan as is an Environment Agency Requirement. EA published guidelines dictate that the site engineer must keep detailed records containing both test reports and rejection criteria for the assessment of the product.

All manufacturers are required to provide a CE declaration of performance for all materials delivered to site. This will detail the materials specification criteria and subsequent manufacturing tolerances.

In order to ensure that the product is being tested against properties that are of significance to the design it is important to consider the product specification against the function. For example, geotextiles for filtration will have a very different set of performance criteria to geotextiles used for protection.

It is recommended that conformance testing be application specific, this ensures that tests conducted are relevant to use.

Test	Standard	Application Function	
		Filtration	Protection
Tensile Strength	EN ISO 10319	Every 6000m ²	Every 6000m ²
Tensile Elongation	EN ISO 10319	Every 6000m ²	Every 6000m ²
CBR	EN ISO 12236	Every 6000m ²	Every 6000m ²
Cone Drop	EN ISO 13433	Every 6000m ²	Every 6000m ²
Pore Size	EN ISO 12956	Every 12,000m ²	Not Applicable
Water Flow	EN ISO 11058	Every 6000m ²	Not Applicable
Thickness @ 2kPa	EN ISO 9863-1	Not applicable	Every 2500m ² (nominal value)
Tensile Tests for joints	EN ISO 10321	As Required	

Table 1: HPS recommended CQA test frequency

Test	Standard	Test Frequency
Tensile Strength	EN ISO 10319	Every 6000m ²
Tensile Elongation	EN ISO 10319	Every 6000m ²
CBR	EN ISO 12236	Every 6000m ²
Cone Drop	EN 13433	Every 6000m ²
Water Flow	EN ISO 11058	Every 6000m ²
Thickness @ 2kPa	EN ISO 9863-1	Every 2500m ² (nominal value)
In plane flow capacity @ 20 kPa i = 1	EN ISO 10321	Every 12,000m ²
@ 100kPa i = 1		
@ 200kPa i = 1		
Tensile Tests for joints	EN ISO 10321	As Required

Table 2: GPT recommended CQA test frequency

It should be noted that manufacturing data sheets will always be subject to tolerances, it is therefore important that a designer fully understands these to ensure that they are not below design acceptable values. The suggested frequencies are for initial guidance only, these are index tests only and will not indicate site performance. A designer should consider the requirements of the site when reviewing conformance requirements.

Sampling

For sampling, EN ISO 9862 should be applied, samples should be taken not less than 5m from the end of the roll in machine direction and over the full width of the roll in the cross machine direction.

The location of each sample should be described exactly. Each sample should be marked clearly with:

- The manufacturers name,
- Product identification
- Roll/batch number

Evaluation of Conformity

It should be noted that the data sheets supplied by Geofabrics and by most manufacturers supply data based on manufacturing means, all of which would normally include a tolerance value. This is important and should be considered at a design stage.

The tolerances for products can be found on the CE DoP, these are based on 95% Confidence Limits as per the relevant EN standards. On this basis there are two principal methods that can be used for the evaluation of conformity to a given specification (as per LFE7).

1. **Evaluation of conformity by simplified procedure.** A delivery lot is considered to fail if one or more of the samples tested do not meet one or more of the declared values on the CE declaration or relevant applications properties. The supplier may choose to replace the rejected lot or to carry out further testing (in accordance with 6.2.3) on new samples from the product delivered to the site. The results obtained on the previously tested samples should be included in the evaluation
2. **Evaluation of conformity by statistical procedure.** This evaluation may be used if there are five or more samples taken from the site. The lot is accepted when:
 - All the values measured are within the design specification
 - or
 - If one or more of the values measured are outside the design specification then perform the following calculation:

$$(X - 1.645 *s) \geq Q_{min5\%} \text{ (lower limiting 5\%-Quantile in case of minimum value)}$$

and/or

$$(X + 1.645 *s) \leq Q_{max5\%} \text{ (upper limiting 5\%-Quantile in case of maximum value)}$$

Where:

X = mean value of the test results of the samples

S = standard deviation of the test results of the samples

Q_{min5%} = lower limiting quantile = lower specification value (in this case 5% nonconforming)

Q_{max5%} = upper limiting quantile = upper specification value (in this case 5% nonconforming)

Data available from the manufacturer:

It should be noted that some tests are not suitable for the evaluation of conformance, this may be due to limitations in time or because of the construction of the material. For example, most tests relating to the durability of a polymer take considerable time and expenditure. Therefore, under EA guidance such information can be obtained directly from the manufacturer where appropriate. Geofabrics can provide guidance on this where required, alternatively seek advice from the testing laboratory.

Manufacturer's quality control

The level of quality control within the manufacture of a geosynthetic is important in ensuring that a material meets its reported specification. The Environment Agency requires that the CQA plan for any given site provide confidence that the materials incorporated within the works are manufactured to a quality in accordance with the design requirements. All materials are manufactured in an ISO 9001 environment and quality assured to relevant BS EN ISO standards. The Company's laboratories are UKAS accredited (UKAS is the premier laboratory accreditation service in the UK and requires extremely high standards for test accuracy and repeatability). The laboratories also provide assistance to engineers wishing to identify the geosynthetic best suited to a project and can undertake performance tests (such as the cylinder test) tailor-made to the customers' requirements.

Measuring Properties:

Index tests enable a direct comparison to be made between different geotextiles. They are also used for quality control during manufacturing. Most UK specifications either reference a product or set a performance specification based on three or four tests with required values. Tensile strength, pore size, water flow, CBR puncture resistance and cone drop perforation are the most common properties to be listed in a specification. Mass per unit area is also frequently specified though this is not necessary, as it is not a performance characteristic.

Direct comparison of published data is possible when the same test methods are used which in the UK should be EN standards. Any supplier of geotextiles to a UK contract is required to submit the measured properties of their materials to the latest published European Standards. Engineers should not accept data from individual member countries or non-member countries.

For instance, the USA publishes data from different non-comparable tests (ASTM standards), often in non-SI units. Wherever an ISO test standard has been published in the USA, European and all other countries belonging to the International Standards Organisation have agreed the test standard internationally using SI units (e.g. kN and m - not lbs and ft).

As one of the European countries, engineers in the UK are required to specify geotextile test methods as published by the Comité Européen de Normalisation (CEN). These test standards are published and ratified by the British Standards Institute (BSI) and given a BS designation. Many of these standards were originally part of BS6906 which have now been adopted at European level with EN designations. Some test standards have international recognition and are ratified by the International Standards Organisation (ISO).

Quality Control Production Testing

The required internal quality control procedures are as follows:

Test	Method	Frequency
CBR	EN ISO 12236	6000m ²
Tensile Strength	EN ISO 10319	6000m ²
Tensile Elongation	EN ISO 10319	6000m ²
Cone Drop	EN ISO 13433	6000m ²
Thickness	EN ISO 9863-1	6000m ²

Product specific tests are conducted in accordance with this and are application dependant.

Needle detection procedure

During manufacture, the geotextile passes close to three sets of magnets which remove metal particles up to 12g and >2mm. Just before the roll up, the geotextile passes through an electronic metal detection field. Audio and visual alarms indicate if metal particles are detected. Rolls are sent to stock if they pass through the field without an alarm event or, in the case of an alarm event, the operator inspects the suspect area, locates any metal particles, and removes them. If unsuccessful, or if any doubt remains as to the presence of metal particles, then the roll goes to the re-inspection facility.

The re-inspection facility allows geotextile to be unwound and passed between two electronic metal detectors designed to locate metal particles >2mm. If there is an alarm detection, the line stops automatically, and the operator uses a hand-held detector to locate and remove any particles. When restarted, the web automatically reverses by 1m then detection resumes i.e. the failed section passes the detectors repeatedly until there are no more alarms. Once the whole roll has passed the detectors without stopping it is deemed to have no detectable particles present.

This detection process is thought to be the most comprehensive found world-wide for this type of geotextile and therefore our geotextiles are the least likely to contain any metal fragments. Any latent risk is considered negligible.

We actively encourage visitors to come and see the system operating. Whilst we can confidently say at the end of the process that no metal has been detected we regret we cannot, in all honesty, certify absolutely that the geotextile is needle free and so such a certificate does not form part of our Quality Control documentation.

