JUTA | TITANTECH

MANUFACTURING QUALITY ASSURANCE (MQA) and MANUFACTURING QUALITY CONTROL (MQC)

Version 1.0
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Tiltex SYSTEM

CONFIDENTIALITY NOTICE

This manual contains confidential company information and is to be distributed exclusively to those personnel who are directly involved with the manufacturing and evaluation of TILTEX.

This document shall not be publicly distributed without the express consent (verbal or written) of JUTA UK

This document is of a general nature. The data sheets enclosed are for reference only and should not be construed as being offered for any quotation or priced bid. Separate offers will be released with Job specific data sheets at the time of quoting.

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INTRODUCTION

1.1. Definitions

This manual contains objectives and criteria for maintaining JUTA UK **Geosynthetic Cementitious Composite Mat** under the commercial name TILTEX (hereinafter referred to as: "GCCM" or „TILTEX") Manufacturing Quality Control and Manufacturing Quality Assurance as defined below:

Manufacturing Quality Control (MQC) refers to a planned system of inspections for directly monitoring and controlling the quality of the TILTEX product during the manufacturing process. MQC is performed by JUTA UK (hereinafter referred to as: „JUTA UK" or „the Company") to ensure that the specified values for TILTEX are achieved.

Manufacturing Quality Assurance (MQA) refers to a planned system of activities providing the assurance that the manufactured products meets its specified properties.

Quality control procedures are implemented on those components and finished products which are manufactured by JUTA UK. Quality assurance procedures are implemented on the components of our products that are provided by external suppliers. Therefore, this manual contains an integrated series of procedures that may be classified as both MQA and MQC, as determined by the source of the component materials.

1.2. Policy statement

The Manufacturing Quality Assurance / Quality Control Manual has been prepared by JUTA UK. This policy states that our primary goal is to achieve optimum productivity while assuring full customer satisfaction. To reach this goal, JUTA UK is committed to the pursuit of continuous improvement of all processes and materials utilized in the manufacture of its products.

COMMITMENT TO QUALITY

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COMMITMENT TO QUALITY

JUTA UK is fully committed to the goal of continuous quality improvement. This commitment starts as early as the production of TILTEX and only ends when the material is received by our customer.

Our goal is to provide the highest quality product and to ensure that it is produced, stored and transported in a manner that minimizes its impact on the environment.

The main aim is to satisfy the needs and expectations of its clients, through quality, variety, competitive rates, innovation and the ongoing development of its organizational and production processes.

In addition, we are committed to continually reviewing our services to not only meet all of our customers' needs and requirements, but to exceed them. This commitment to quality is delivered through a documented quality management system, ongoing staff training, investment in technology and an emphasis on process control.

Another key aspect of JUTA UK's policy is respect. It should be an essential part of all dealings between company employees and clients, suppliers and other interested parties, towards the environment and towards all our surroundings.

Therefore, JUTA UK employees support and implement a comprehensive quality policy. Programs and procedures to implement this quality principle are developed by the Quality Department and applied by every employee of the company.

When performing day-to-day work for clients, the company ensures its compliance with national and international standards. JUTA UK's work and services are under constant control of internal inspections (4 internal audits per year) and external independent foreign auditors (2 times per year).

COMMITMENT TO QUALITY

THE ENVIRONMENTAL AND QUALITY POLICIES

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THE ENVIRONMENTAL AND QUALITY POLICIES

JUTA UK has CE certificate of Factory Production Control for its products. This certificate confirms that the full range of products complies with the provisions of the Construction Products Regulation (CPR) and relevant harmonized European standards.

JUTA UK is registered with the International Organization for Standarization (ISO) and follows a quality management system. Quality assurance confirmed by ISO 9001 certification streamlines production and helps ensure that final products meet the company's quality criteria. It ensures that the processes used to design, test and manufacture products will run correctly.

In manufacturing, quality assurance methods such as ISO 9001 and ISO 14001 help manage and improve many processes, including:

- ourcing and purchasing raw materials which are proven, and the manufacturers of raw material have their own controlled management system confirmed with a certificate (national or international standard). Delivery inspection data is collected daily and stored in an internal laboratory.
- applying inspection procedure
- adherence to manufacturing processes
- responding to defects

This provides the means to establish a sustainable quality assurance program, ensuring that everything from raw materials to inspection procedures are of the highest quality. Problems and defects resulting from poor quality materials or third-party components are almost completely eliminated.

This integrated management system, which requires the inclusion of all Eurobent staff, leads us via appropriate procedures to achieve a permanent improvement in quality and in the environmental management. This can be achieved, amongst other things by reducing the environmental impact of all services which can affect our surroundings, including users and suppliers. All efforts shall be directed into preventing contamination and a sustainable use of resources, through the fulfillment of the legal and statutory requirements applied to the developed activity, and through a continuous and exacting pledge to comply with health and safety directives.

The principles which have been established to achieve the aims of this process are:

- the fulfilment of all contractual requirements
- continual improvement of processes, procedures and services
- efficient assigning of functions and responsibilities
- careful selection of suppliers
- personal training and development

The Management pledges to develop, improve and apply the quality and environmental criteria defined in the documentation of the Integrated Management System and requests adherence from all employees of the company in ways relevant to them.

The Environmental and Quality Policies describe specific objectives for distinct areas of the company and are available on request to anyone interested.

QUALITY OF PRODUCT

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QUALITY OF PRODUCT

Our products are developed according to customer requirements and design specifications, while complying with
EN 13253:2016,
EN 13254:2016,
EN 13255:2016,
EN 13256:2016,
EN 13257:2016.

For customers who work in markets that require special regualtions, JUTA UK offer products certified by their regional chambers. In case of not having such certificates. JUTA UK may apply for them. Inthis way, our products are approved for sale and use throughout the world, and guarantee the highest quality in accordance with the requirements of individual markets.

TILTEX manufactured by JUTA UK guarantee the highest quality and specification compliance through the manufacturing process and selection of the highest quality components.

JUTA UK only works withthe best and proven raw material suppliers. Contractors are certified and are leading manufacturers in their industry. The delivery control system in accordance with the Quality Control Manual and ISO requirements ensures that our products are manufactured from the best components available on the market.

In case of TILTEX, the primary raw material is non-woven geotextile serving as a carrier layer to which a layer of cement and sand mix is applied and then covered also with a NW geotextile cover layer. The cement-sand mix is locked between geotextiles by a needling process so the layers do not separate and block the movement of the cement and sand mix inside the mat. This guarantees an even distribution of cement-sand mix on the entire surface of the TILTEX, so its properties are the same on the entire protected surface.

The amount of cement-sand mix used in the production of our products is selected for the required properties, or customized to meet customer requirements.

REFERENCED STANDARDS AND TEST METHODS

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REFERENCED STANDARDS AND TEST METHODS

Harmonized technical specification

1. **EN 13253:2016** - Geotextiles and geotextile-related products - Characteristics required for use in erosion control (bank protection and shore protection)
2. **EN 13254:2016** - Geotextiles and geotextile-related products - Characteristics required for products used in the construction of reservoirs and dams
3. **EN 13255:2016** - Geotextiles and geotextile-related products - Characteristics required for use in the construction of canals
4. **EN 13256:2016** - Geotextiles and geotextile-related products - Characteristics required for use in liquid waste containment
5. **EN 13257:2016** - Geotextiles and geotextile-related products - Characteristics required for use in solid waste disposals

International Organization for Standardization

1. **EN ISO 10319:2015** – „Geosynthetics – Wide-width tensile test"
2. **EN ISO 12236:2006** – „Geosynthetics – Static puncture test (CBR test)"
3. **EN ISO 13433:2006** – "Geotextiles and geotextile-related products - Determination of perforation dynamics (Cone Drop test)"
4. **EN 14574** – "Protection efficiency"
5. **EN 12467:2016-8** – "Fibre-cement flat sheets - Product properties and test methods"

American Society for Testing and Materials (ASTM)

1. **ASTM D 6460** – "Standard Test Method for Determination of Rolled Erosion Control Product (RECP) Performance in Protecting Earthen Channels from Stormwater-Induced Erosion"
2. **ASTM D 5887** – "Standard Test Method for Measurement of Index Flux Through Saturated Geosynthetic Clay Liner Specimens Using a Flexible Wall Permeameter"

MANUFACTURING QUALITY ASSURANCE / CONTROL

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MANUFACTURING QUALITY ASSURANCE / CONTROL

JUTA UK has a an on-site quality assurance laboratory at its manufacturing facility, which has a fully equipped, well-staffed, dedicated & qualified employees with strict procedures to maintain the highest level of finished products' quality. Qualified staff ensures product quality from the receipt of raw materials, through the production process, to testing on finished products. Laboratory technicians continually perform numerous tests on our products to ensure that their high standards are consistently maintained. A continuous communication link is maintained between the laboratory and manufacturing personnel, maximizing production efficiency and product quality. Cooperation with external certified laboratories allows continuous control of our products.

6.1. Raw material quality assurance

We state hereby, that purchased raw material used for production meet the specifications for manufacturing our product of the desired high quality. Our quality control plan is described in our CE Manual and assigns the task of verifying incoming material and details the inspection that is required. JUTA UK has established strict specification testing procedures for all raw materials. Test results must fall within the acceptable limits. The material is not accepted unless all standard test requirements are complied with. Copies of the supplier's certificate of analysis for each lot of the materials are supplied as a standard documentation.

6.2. Supplier's Qualification's

JUTA UK's Internal Quality Control plan specifies the standards that suppliers must meet in order to supply their raw material. According to the ISO 9001 standards our organisation provides external audits once a year by suppliers and keeps records for a period of 5 years to ensure that suppliers perform all duties according to raw material and national and international procedures considered critical for the success of the quality plan are in place. Internal Quality and Logistics cooperate and perform a delivery plan weekly as well as the list of qualified suppliers periodically (once a year).

6.3. Audits and corrective actions

Internal audits of JUTA UK's manufacturing quality program is conducted quarterly by JUTA UK and annually by an external ISO auditor to determine the adequacy of quality procedures and the degree of compliance with those procedures. Additional audits are conducted in case of necessity by plant management.
The results of the audits are communicated to JUTA UK's management representative and to the employees of the department in which the non-compliance occurs. If the audit indicates that major corrective actions are necessary to achieve compliance with quality objectives, a quality improvement plan will be prepared and submitted to the Management Representative. Documentation of all audits and corrective action plans is maintained by JUTA UK. The implementation of the quality improvement plan is managed by the JUTA UK management representative and coordinated by the Quality Management System Representative.
According to ISO programmed rules JUTA UK provides a corrective action plan, which is the key to solving quality problems and specifies how to deal with them. Our quality assurance plan specifies that person responsible for quality assurance verify how the non-compliance are originated. This type of feedback is consistently applied by the company and results in continuous improvement in company performance.

6.4. Quality Feedback

JUTA UK's quality assurance plan ensures that the procedures in place result in a quality product; our Company derives full benefits from such an initiative via the feedback mechanism. Our quality assurance plan implements feedback through investigation of customer complaints and the correction of non-compliance issues. Person responsible for quality assurance receive copies of all customer complaints (Trade Department – Quality – Production – Trade Department). All staff involved check to see if they are the result of non-compliance with the quality assurance plan and, if necessary, notices that a process is not in accordance with the applicable procedures (a non-compliance report). The non-compliance reports are the feedback used to track quality issues back to their origin.

MQA / MQC PROCEDURES

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MQA / MQC PROCEDURES

This section of the Production Quality Assurance and Control Manual describes JUTA UK's procedures for monitoring raw material quality. This allows for the verification of critical quality parameters prior to use of the components in the finished GCCM product, as well as the actual production process and monitoring of the quality of the finished product. This program allows immediate verification of critical production parameters used to monitor production quality, while the laboratory test program will verify the specified engineering characteristics of the GCCM.

At Eurobent, all raw materials are CE certified. Therefore, the initial inspection is mainly carried out visually to check the quantity and type of purchased material. The result of the pre-inspection is compared with the order and the delivery note. The quality of purchased raw materials is certified with appropriate documents such as approvals, measurement protocols, and CE declaration of conformity. Subsequent minimum inspections are carried out according to the inspection plan.

All raw materials are stored in such a way that they cannot be contaminated or damaged, so that they cannot adversely affect the quality of the manufactured product.

The following test frequency figures indicate the minimum test frequency. If the supplied raw material or final product changes during a work shift, secondary inspections are carried out.

MQA / MQC PROCEDURES

7.1. Nonwoven Geotextile

Nonwoven geotextile is delivered to the JUTA UK's plant in rolls of varying lengths, depending on the type ordered.
The nonwoven geotextile is also subjected to regular conformance tests at the supplier's plant.
Nonwoven geotextile samples are obtained from each end portion of the roll provided they are not visibly different from other portions. Using a utility knife, full roll-width samples are cut from the end of the roll. Five specimens are cut from each sample for density and tensile testing.
The nonwoven manufacturer specifies according to the norms the minimum types of tests and their frequency for MQC woven geotextile prior to incorporation into JUTA UK products. They shall provide test data for each delivery received at our plant.
Mass per unit area testing of the thirty-two specimens cut from the sample of nonwoven geotextile is performed in general Accordance with EN ISO 9864. Tensile testing of the nonwoven geotextile is also conducted on twelve specimens. Tensile strength and elongation tests on these specimens are performed in general Accordance with EN ISO 10319.
If testing reveals the numerical quality standards listed below are not consistently achieved, that roll of material will not be used for production unless further testing confirms that the geotextile is acceptable with respect to its required mass per unit area and grab strength values. Statistical evaluation of the test data may be employed to make this determination.
Eurobent receives and maintains on file manufacturer's certifications stating that the products meet the engineering specifications
Each nonwoven roll is labeled with a lot and roll number. Roll placed into the production is recorded on a daily operating log. This procedure allows the usage of the nonwoven to be tracked such that its lot and roll number can be directly determined from the corresponding final product lot and roll number.

Minimum inspections and testing frequency run by JUTA UK for carrier layer and cover layer - nonwoven geotextile

Line	Test	Task	Frequency	Standard
1	Delivery note and declaration of conformity from supplier	Inspection whether the delivery is compliant with the order and technical requirements	Every delivery	---
2	Visual inspection	Packaging integrity, physical appearance, cleanness	Every delivery	---
3	Unit surface weight	Assesment of conformity to technical specifications	- first delivery - in case of doubts	EN ISO 9864
4	Static Puncture Resistance (CBR test)	Assesment of conformity to technical specifications	- first delivery - in case of doubts	EN ISO 12236
5	Tensile Strength	Assesment of conformity to technical specifications	- first delivery - in case of doubts	EN ISO 10319
6	Elongation at break	Assesment of conformity to technical specifications	- first delivery - in case of doubts	EN ISO 10319
7	Width	Assesment of conformity to technical specifications	- in case of doubts	

7.2. Geomembrane

When geomembrane is attached to TILTEX as in the TILTEX Plus product series, the geomembrane shall be subjected to the MQC testing outlined in below Table by JUTA UK.

Minimum inspections and testing frequency run by JUTA UK for geomembrane

Line	Test	Task	Frequency	Standard
1	Delivery note and declaration of conformity from supplier	Inspection whether the delivery is compliant with the order and technical requirements	Every delivery	
2	Visual inspection	Packaging integrity, physical appearance, cleanness	Every delivery	
3	Unit surface weight	Assesment of conformity to technical specifications	- first delivery - in case of doubts	EN ISO 9864
4	Width	Assesment of conformity to technical specifications	- in case of doubts	
5	Thickness	Assesment of conformity to technical specifications	- in case of doubts	EN ISO 1849-1
6	Reaction to fire	Assesment of conformity to technical specifications	- in case of doubts evaluate with an external LAB	EN 13501-1
7	Watertightness	Assesment of conformity to technical specifications	- 1 x year- in case of doubts evaluate with an external LAB - For verification purposes upon request, additional external inspection at a certified external LAB	EN 1928
8	Dangerous substances	Assesment of conformity to technical specifications	-in case of uncertainty	EN 13967

7.3. Cement-sand mix

Cement-sand mix incorporated into the TILTEX is supplied by one or more suppliers. The suppliers provide test data for each shipment received at the plant. Producer is responsible for aspects of the processing as processing to the correct gradation, adherence to internal quality control procedures and loading into trucks for shipment to JUTA UK manufacturing facilities.

Minimum inspections and testing frequency run by JUTA UK for cement-sand mix

Line	Test	Task	Frequency	Standard
1	Delivery note and declaration of conformity from supplier	Inspection whether the delivery is compliant with the order and technical requirements	Every delivery	---
2	Visual inspection	Packaging integrity, physical appearance, cleanness	Every delivery	---

7.4. Finished TILTEX

Finished TILTEX samples are tested at the frequencies and according to the procedures in below tables. All data are recorded and compared to established order specifications. If materials do not meet the required average values and/or customer specifications, production personnel are immediately notified to make appropriate adjustments. Only products meeting the standard values and customer specifications are approved for shipment to the project.
This section of the manual describes the sampling and testing procedures implemented to ensure that each roll of TILTEX was manufactured to standard design specifications. Quality Control Manual specifies the minimum types of tests and their frequency for the MQC of the finished GCCM. Depending on the frequency of testing, roll lengths are specified during production so that they can be extended for sampling.
The test procedures for cement-sand mix mass per unit area are performed in accordance with EN ISO 14196.
The sample for tensile strength test is taken from the full-width roll at a frequency of one sample per 20,000 m2 and tested according to the procedures in EN ISO 10319 (tensile strength per unit width is given in kN/m). Five test samples are cut from full-width roll. During the tensile strength test, elongation at break is also tested.
Static Puncture Resistance (CBR) tests are performed at a frequency of one sample per 20,000 m2. The test is carried out in accordance with EN ISO 12236. The sample is in the form of a circle, which is then placed in a puncture machine. Five test specimens are cut from full width roll.

Minimum inspections and testing frequency run by JUTA UK for cement-sand mix

Line	Test	Task	Frequency	Standard
1	Compliance with the order from client	Inspection of the finished product for compliance with the order	Every roll	---
2	Marking	Checking transparency and indelibility of symbol GCO in accordance to PN EN ISO 10320	Every roll	---
3	Visual inspection	Packaging integrity, physical appearance, cleanness	Every roll	---
4	Unit surface weight	Assesment of conformity to technical specifications	1 x 20 000 m²	EN 14196
5	Thickness	Assesment of conformity to technical specifications	1 x 20 000 m²	EN ISO 9863-1
6	Tensile Strength	Assesment of conformity to technical specifications	1 x 20 000 m²	EN ISO 10319
7	Elongation at break	Assesment of conformity to technical specifications	1 x 20 000 m²	EN ISO 10319
8	Static Puncture Resistance (CBR)	Assesment of conformity to technical specifications	1 x 20 000 m²	EN ISO 12236
9	Dynamic puncture resistance (Cone drop test)	Assesment of conformity to technical specifications	1 x 6 months	EN ISO 13433
10	Protection efficiency (pyramid puncture resistance)	Assesment of conformity to technical specifications	1 x year	EN 14574

7.4.1. TILTEX Properties

TILTEX products shall be tested in accordance with the test methods, test frequencies and material physical properties as listed in the following data sheets:

TECHNICAL DATA SHEET

TILTEX

Mechanically bonded composite, consisting of concrete-sand mix, embedded and fixed between two layers of geo-textile.

ESSENTIAL CHARACTERICTICS					
Properties of TILTEX(1)	**TILTEX 7**	**TILTEX 9**	**TILTEX 10**	**TILTEX 12**	**EN 13253, EN 13254, EN 13255, EN 13256, EN 13257 - (System 2+)**
Mass per unit area EN 14196	7600 g/m² (±10%)	9600 g/m² (±10%)	10600 g/m² (±10%)	12600 g/m² (±10%)	
Thickness EN ISO 9863-1/-2	7,0 mm (±1mm)	9,0 mm (±1mm)	10,0 mm (±1mm)	12,0 mm (±1mm)	
Tensile Strength MD/CMD	EN ISO 10319		20,0 / 20,0 kN/m (-2 kN/m)		
Elongation at break MD/ CMD	EN ISO 10319		40 / 40 % (±10%)		
CBR Puncture Strength	EN ISO 12236		3,0 kN (-0,3 kN)		
Dynamic puncture resistance	EN 13433		0 mm (+1 mm)		
Protection efficiency	EN 14574		5,0 kN (-0,5 kN)		
Durability	EN 12226		NPD		
	EN 12224		NPD		
Dangerous substances	PN EN 12467:2016-8 5.6.2		NPD		
ADDITIONAL CHARACTERISTICS					
Setting start	PN-EN 196-3		>90 min		
Compressive Strength	PN EN 196-1		40 Mpa		
Bending Strength	PN EN 12467:2016-08 5.4.3		6,0 MPa – Class 1		
Water permeability	PN EN 12467:2016-08 5.4.5-6		No drop of water		
Durability against Freeze-thaw	PN EN 12467:2016-08 5.5.2		R_L ≥ 0,75 Pass		
Durability against Heat-rain	PN EN 12467:2016-08 5.5.3		R_L ≥ 0,75 Pass		
Durability against warm water	PN EN 12467:2016-08 5.5.4		R_L ≥ 0,75 Pass		
Durability against Soak-dry	PN EN 12467:2016-08 5.5.5		R_L ≥ 0,75 Pass		
Reaction to fire	PN EN 12467:2016-08 5.6		B-s1, d0*		
Resistance to Roots	PD CEN/TS 14416:2014		Passed		
Manning's Value	ASTM D 6460		n = 0,022		
Standard Roll Dimensions	**Test Method**		**Value**		
Width x Length	Typical		5,0 x 20 m (±2%)	2,5 x 20 m (±2%)	1,0 x 5,0 m (±2%)
Quantity	Typical		100 m²	50 m²	5 m²

(1) before hydration (2) after hydration *complies with EN 13501-1

These data are average values derived from standard tests and are subject to usual product variation.

The right is reserved to make changes without notice at any time.

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TECHNICAL DATA SHEET

TILTEX Plus

Mechanically bonded composite, consisting of concrete-sand mix, embedded and fixed between two layers of geo-textile and glued to a PE membrane (type A in accordance with EN 13967+A1:2012).

ESSENTIAL CHARACTERICTICS					
Properties of TILTEX(1)	**TILTEX 7**	**TILTEX 9**	**TILTEX 10**	**TILTEX 12**	**EN 13253, EN 13254, EN 13255, EN 13256, EN 13257 – (System 2+)**
Mass per unit area EN 14196	7600 g/m² (±10%)	9600 g/m² (±10%)	10600 g/m² (±10%)	12600 g/m² (±10%)	
Thickness EN ISO 9863-1/-2	7,0 mm (±1mm)	9,0 mm (±1mm)	10,0 mm (±1mm)	12,0 mm (±1mm)	
Tensile Strength MD/CMD	EN ISO 10319		20,0 / 20,0 kN/m (-2 kN/m)		
Elongation at break MD/CMD	EN ISO 10319		40 / 40 % (±10%)		
CBR Puncture Strength	EN ISO 12236		3,0 kN (-0,3 kN)		
Dynamic puncture resistance	EN 13433		0 mm (+1 mm)		
Protection efficiency	EN 14574		5,0 kN (-0,5 kN)		
Durability	EN 12226		NPD		
	EN 12224		NPD		
Dangerous substances	PN EN 12467:2016-8 5.6.2		NPD		
ADDITIONAL CHARACTERISTICS					
Setting start	PN-EN 196-3		>90 min		
Compressive Strength	PN EN 196-1		40 Mpa		
Bending Strength	PN EN 12467:2016-08 5.4.3		6,0 MPa – Class 1		
Water permeability	PN EN 12467:2016-08 5.4.5-6		No drop of water		
Durability against Freeze-thaw	PN EN 12467:2016-08 5.5.2		R_L ≥ 0,75 Pass		
Durability against Heat-rain	PN EN 12467:2016-08 5.5.3		R_L ≥ 0,75 Pass		
Durability against warm water	PN EN 12467:2016-08 5.5.4		R_L ≥ 0,75 Pass		
Durability against Soak-dry	PN EN 12467:2016-08 5.5.5		R_L ≥ 0,75 Pass		
Reaction to fire	PN EN 12467:2016-08 5.6		B-s1, d0*		
Resistance to Roots	PD CEN/TS 14416:2014		Passed		
Manning's Value	ASTM D 6460		n = 0,022		
Standard Roll Dimensions	**Test Method**		**Value**		
Width x Length	Typical		5,0 x 20 m (±2%)	2,5 x 20 m (±2%)	1,0 x 5,0 m (±2%)
Quantity	Typical		100 m²	50 m²	5 m²

(1) before hydration (2) after hydration *complies with EN 13501-1
**Manufacturer can use foil in range of 0,2 –2,0
These data are average values derived from standard tests and are subject to usual product variation.
The right is reserved to make changes without notice at any time.

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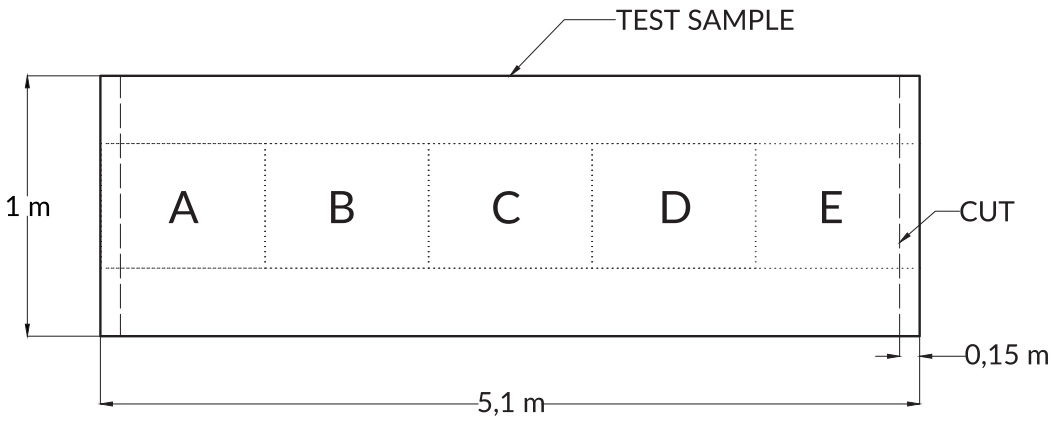
7.5. Sampling and MQA Report

TILTEX rolls are sampled for quality testing according to the frequency specified in the quality control plan. For quality testing, a sample is cut approximately 30 cm wide per roll. Test samples are taken from five locations across the width of the roll. An archive sample of approximately A4 size (30 cm x 30 cm) is labeled and stored for 5 years for future use.

The following figure shows the sampling guidelines for finished TILTEX product.

GUIDE FOR OBTAINING SAMPLES



NOTES

1. The dashed lines indicate the acceptable „windows" from which samples A, B, C, D, and E are cut.
2. Specimens are cut at random locations within each window.
3. All specimens must be cut using a die.
4. At least one sample is archived.

JUTA UK maintains all necessary reports and samples for products produced and sold. Records and samples are maintained according to JUTA UK's standard policy outlined below:

ITEMS	YEARS
Supplier's test reports and certifications	10
JUTA UK's Internal Test Reports	5
Samples of TILTEX and raw materials	5
Measurements from raw materials and finished products	10

7.6. Reporting / Manufacturing Internal Test Reports

All rolls supplied for a specific project or order can be provided with a Manufacturing Quality Assurance document (also called ITR – Internal Test Report / ICP – Inspection Certificate of Product / Mill Test / MQA certificate etc.) This report identifies the standards on which approval is based along with the actual test results demonstrated by the material. Each report is reviewed by quality assurance personnel, stamped, and signed by a laboratory technician.

Internal test reports according to frequency for produced and loaded liner

JUTA UK **Kliczkowska 42** **PL-58-100 Świdnica**	**INSPECTION CERTIFICATE OF PRODUCT**	**TRUCK**

TILTEX ... Mechanically bonded composite, consisting of concrete-sand mix, embedded and fixed between two layers of geo-textile	Delivery data		
	Delivery number	Date of shipping	Quantity
	Roll no:		m^2

No.	Parameter to be controlled		Index value	Values controlled					Marked value	Conform	
				1	2	3	4	5	Average	Yes	No
1.	Mass per unit area of concrete *EN 14196* *(at 0% moisture content)*		... g/m2 (±10%)						g/m2		
2.	Mass per unit area of GCCM *EN 14196* *(at 0% moisture content)*		... g/m2 (±10%)						g/m2		
3.	Thickness *EN ISO 9863-1*		... mm (±1mm)						mm		
4.	Tensile strength *MD EN ISO 10319* *CD EN ISO 10319*	II	20,0 (-2) kN/m						kN/m		
		⊥	20,0 (-2) kN/m						kN/m		
5.	Elongation at Break *MD EN ISO 10319* *CD EN ISO 10319*	II	40 (±10)%						%		
		⊥	40 (±10)%						%		
6.	CBR Puncture strength *EN ISO 12236*		3,0 (-0,3) kN						kN		

Remarks: Product was tested before hydration.

Roll no/2022:

Data and signature of technician:

Approved by:

7.7. Packaging and labeling

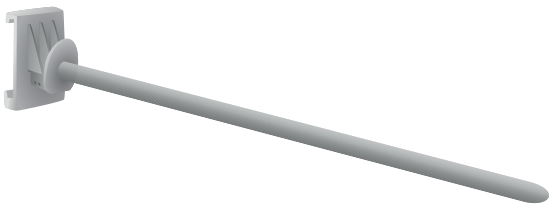
Each roll of TILTEX is packaged in a polyethylene, UV resistant sleeve preventing the roll from moisture. Rips or tears in any packaging shall be repaired if, in the judgement of QC personnel, the damage is considered significant enough to cause the material damage. The sleeves are specially marked as recycle PELD.

Each product of JUTA UK is labeled according to EN ISO 10320 for easy identification after unloading and during installation. Each roll shall be marked with the following information:

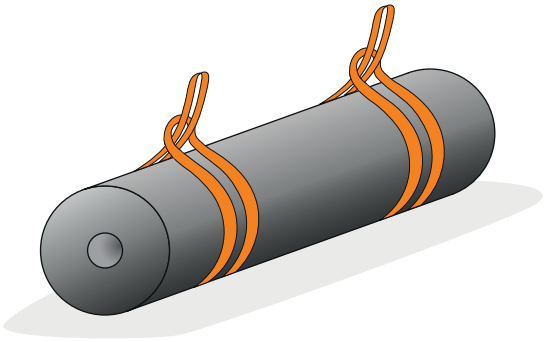
1. Manufacturer's name
2. Product identification
3. Roll number

On each roll of finished product a 8 digit roll number is indicated that is used for tracking of all MQA/MQC information. For example: Roll number 21000100. First two numbers represent year of production. Rest are serial numbers.

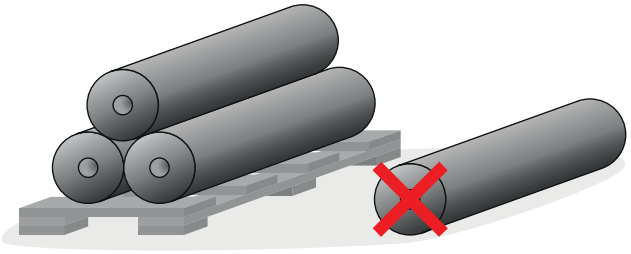
7.8. Plant Storage and Handling



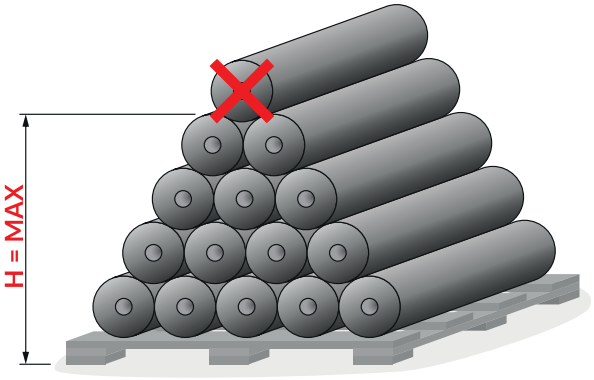
Care is taken at the plant to handle and store the finished rolls in a manner that prevents from damage to the product and its packaging. A handling of the product is executed with a forklift or other suitable vehicle outfitted with a carpet pole or „stinger." The stinger is strong enough to support the weight of a full roll with minimal bending.



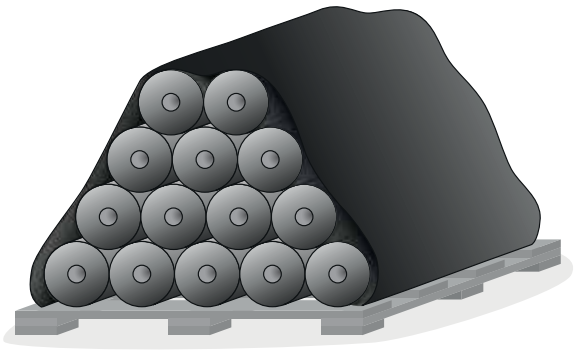
Each roll is equipped into a set of two belts. It is recommended while unloading from the truck to put a steal pipe inside to prevent bending of the roll.



TILTEX can be stored up to two years in a warehouse provided that proper storage procedures are followed.
First, a special area is designated for storage. This area is levelled and dry.
In the warehouse, TILTEX rolls are placed on a base material (wooden beams, pallets) to avoid unnecessary wetting by rain during storage.



Rolls should not be stacked in more than 4 rolls high.
Long-term storage of material in a warehouse is subject to periodic inspection of the state of packaging. Polyethylene sleeves of our rolls are inspected for visible cracks or tears. Damage to the sleeves is immediately repaired with adhesive tape or additional film. Labels, which should always be attached to the roll, are also checked at this time.



JUTA UK products should not be directly exposed to the weather during storage, so if necessary the rolls are covered with a plastic sheet or tarpaulin.

7.9. Material Warranty

Material shall be warranted against Manufacturer's defects for a period of 50 years from the date of purchase.

Below is the standard warranty specimen copy available for information only.

JUTA UK
50 YEARS GUARANTEE

Product Warranty Card

Subject to the following conditions, JUTA UK , with its correspondence address: 42 Kliczkowska Street, 58-100 Świdnica, Poland warrants that products manufactured by JUTA UK shall be free from material defects at the time of delivery by JUTA UK

I. INTRODUCTION
(1) This Warranty shall remain in force for a period of fifty (50) years from the date of purchase.
(2) During the Warranty Period, JUTA UK will replace or, at its discretion, refund the purchase price for any Products that do not meet the above warranty.
(3) When replacing the product with a defect-free product, the Manufacturer's Guarantee covers the delivery of a defect-free product in place of the defective product, in an amount corresponding to the square metres of the damaged surface.
(4) The product will be delivered in a defect-free condition, in a quantity corresponding to the quantity of product that has been damaged as soon as possible, depending on the manufacturer's capabilities, so as not to interfere with the manufacturer's planned production processes. The prerequisite for the recognition of a warranty claim is a complete claim document including appropriate documentation confirming the existence of defects entitling to warranty claims, including in particular the type of defects and how and when they occurred.
(5) Recognition of defects and faults as covered by the warranty requires a statement by the Manufacturer of the recognition of these defects and faults or an expert opinion from a court of law on the causes, timing and extent of defects and faults.
(6) The warranty period shall not be extended after the performance of the warranty service.
(7) The warranty does not cover faults and damage that are not caused by a product defect.
(8) The Purchaser is obliged to minimise the consequences of any defects or faults of the product. He is obliged to notify the Manufacturer immediately of any defects or faults found
and is obliged to make a complaint within a period not later than 7 days from the date of obtaining information about the defects or faults of the product. Otherwise, the Purchaser loses the rights under the Guarantee.

II. EXCLUSIONS
(1) JUTA UK shall not be liable for any breach of warranty caused by:
(A) accident, negligence, abuse or mishandling of the Product, i.e., during transportation, unloading, handling, storage, installation and use not in accordance with specifications, including the failure of the Workplace Owner to exercise reasonable care in maintaining the Product; or
(B) natural events and acts of God, including without limitation earthquakes, floods, hail, tornadoes or explosions
(2) The Guarantor shall not be liable for any external extraordinary event that the Guarantor is unable to prevent and over which the Guarantor has no control, if such an event causes damage to the product covered by the guarantee.
(3) JUTA UK is not responsible for improper installation and use of the product inconsistent with its intended use.
(4) The Purchaser loses the rights arising from the warranty if the product is damaged during transport (according to Incoterms) or installation, or is installed contrary to its intended use. Therefore, the Manufacturer shall under no circumstances be liable for claims arising from improper design, transport or assembly of the product.
(5) The Manufacturer's guarantee does not cover
- accidental damage,
- damages resulting from normal wear and tear,
- damages resulting from improper use,
- mechanical damage caused by machinery, equipment, people or animals,
- damages resulting from accidental or intentional exposure to harmful chemical substances.

III. LAW
(1) This Guarantee shall be governed by the laws of the Republic of Poland as well as by international laws incorporated into the Polish legal system, excluding the UN Convention on Contracts for the International Sale of Goods (CISG)
(2) Any disputes arising from this Guarantee shall be resolved by the Court of the Republic of Poland with jurisdiction over the Guarantor's registered office.

IV. LIMITATIONS
(1) This Warranty is the only warranty applicable to the Product. It supersedes and excludes all other warranty documents of JUTA UK and all other warranties not expressly set forth herein. In particular, this applies to warranties implied by law, custom or otherwise, including by implied warranties of merchantability or fitness for a particular purpose.
(2) JUTA UK does not authorise any person, including its representatives, to make any representations or warranties, conditions or guarantees other than this warranty. Without limiting the foregoing, any warranty as to workmanship or materials other than those manufactured by JUTA UK given by the contractor or subcontractor installing the Product or any subsequent contractor performing work on the Product may be enforced only against such contractor and is not a warranty given by JUTA UK By c they may not be enforced against JUTA UK

V. MISCELLANEOUS PROVISIONS
The failure of JUTA UK at any time to enforce or invoke any of the terms and conditions set forth herein shall not be construed as a waiver of its rights under this warranty. This warranty may not be assigned without the prior written consent of JUTA UK

7.10. Delivery and after sale service

Our Customers expect reliable and competent service delivery. Customer satisfaction with our products and our services is our main goal. The needs of our Customers and Consumers define our tasks, which we just convert into goals. Adjusting to the requirements of our customers and thus market needs are growing all the time and maintain its level of commitment to developing relationships with our Clients at the highest level.

At the same time we also care about the development of our suppliers, who through consistent cooperation and flexible response to our need give proof of its commitment to product and service for the final Customer.

These procedures and requirements are frequently reviewed and adjusted to assure compliance with current market demands and/or predetermined project specifications.

PRODUCTION PROCESSES

08

PRODUCTION PROCESSES

The production line is maintained in such a condition that its ability to produce according to technical specifications is ensured.

The machinery used to manufacture TILTEX is tightly controlled and critical production parameters are automatically monitored. The production control plan specifies the minimum frequency of inspection of production machines and equipment. Human involvement in the production process is essential to maintain the machinery and requirements for quality assurance and control of the manufactured product. Quality control procedures during production focus mainly on maintaining calibration of measurement equipment and operation of the production system.

8.1. Punch density

Punch density refers to the number of needled fibers per unit area connecting the top and bottom JUTA UK geotextiles. The correct punch density has been established to match the different parameters that are maintained during production. Calibration and refurbishment of the needle machines is performed regularly and JUTA UK tear test results provide verification that the punch density meets minimum standards.

8.2. Roll Length and Width

Final panel dimensions are always specified before production. Length measurements are made by continuous monitoring by an electronic linear measuring device connected to the roll at the end of the production line. When the required length is reached, the roll is cut and prepared for storage or shipment. Periodically, the roll is produced one meter longer so that a quality sample of the full width of the roll can be taken.

8.3. Needle detection and removal

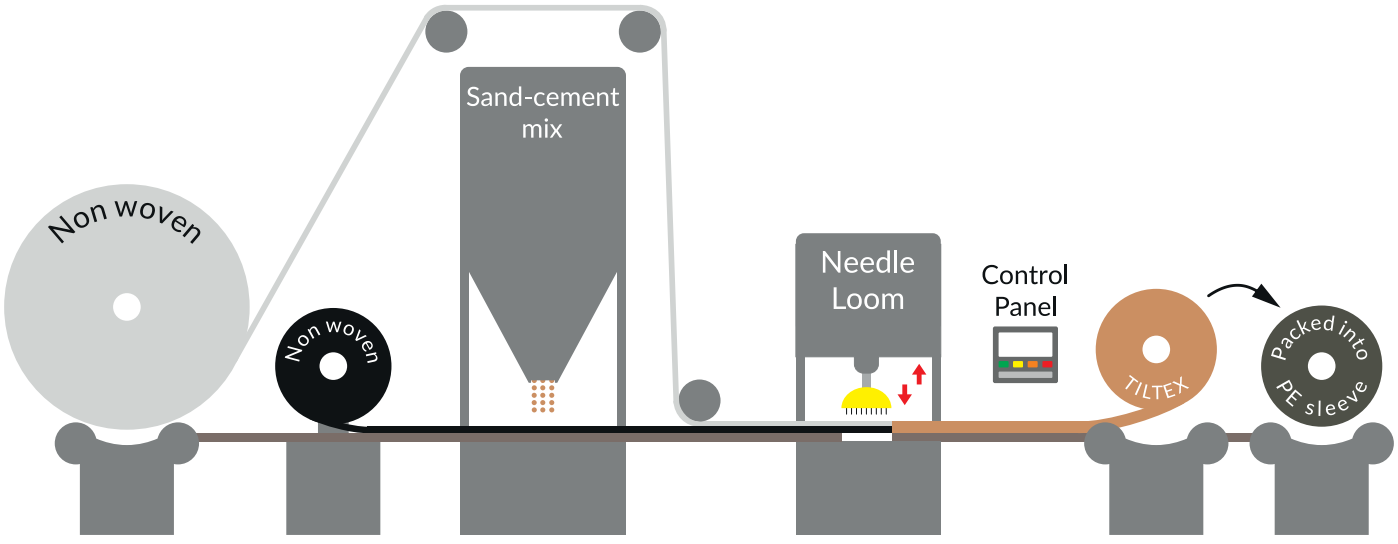
In JUTA UK, production of needle punched-reinforced TILTEX and other geocomposites is conducted under special procedures, that help us to prevent the presence of needle fragments in our final products.

Our system is based on three automatic detection phases and, in addition, on an personal inspection and removal phase made by employees.

It includes not only of metal detectors and magnets but also, what has significant result for that matter, involves our special operating procedures which ensure that broken needles are removed from the roll to the maximum practicable extent.

Needle punching is the process which turns loosely laid fibers into form of continuous fabric. A loose layer of fibers is introduced across a needle loom, whose powerful reciprocating motion a of needles (often numbering 10,000 or more, more than hundred strokes per minute) mounted on a needle board entangle those fibers. Each needle has a barbed shaft which snares fibers on the downstroke and releases them on the upstroke.

Scheme of GCL production line



That kind of process is conducted for production of TILTEX but conditions in which the needles work are extremely hard to them. Thousands of needles moving at hundreds of strokes per minute, have to punch through of bentonite layer covered by two layers: non- wove and woven fabric. Significant forces are applied to the needles during this process. Because of these extreme conditions it may happen that a few needles may be inevitably broken, and its fragments must be removed.

Our quality plan involves strategies as follow:

- to prevent,
- to detect
- to remove broken needles.

Thanks to a variety of procedures relating to the operation of the loom that we have implemented, needle breakage can be largely prevented. Our procedures are focused on: loom operation and maintenance. We provide ongoing supervision, at each work shift loom is checked and cleared, needle boards are changed for new ones every two work shift.

Despite of JUTA UKs strives to eliminate breakage, it should be known that the process of needle-punching across bentonite particles places extreme forces to the needles, and some breakage happens. That is why we installed set of powerful magnets downstream from the loom, across the width of our production line and metal detectors placed just over the surface of produced material. Detector, if some part of needle is detected, gives a sound and light signal. Then the production line is stopped and the procedure of examination is started that lasts until metal part is found by production operators.

The system for controlling the incidence of broken needles in the mat operates continuously throughout production.

8.4. Laboratory equipment inspection

Laboratory equipment used for testing is regularly inspected in accordance with the overall program. Periodic calibration of control and measuring equipment is carried out in accordance and their frequency is checked as required. Mandatory analysis of the accuracy of the quality certificates of the calibrated equipment is also performed. JUTA UK controls the calibration methods including appropriate tolerances for a given test equipment to ensure trouble-free performance in the production of a product with the required quality parameters.

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