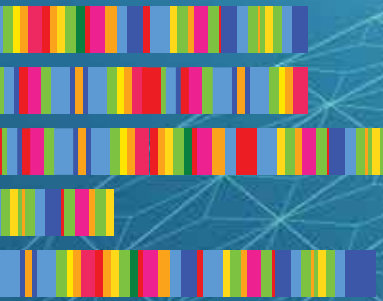


## Geosynthetics Laboratory



- One of the most advanced testing facilities in the industry
- World-class geosynthetics R & D





## ISO/IEC 17025

GENERAL REQUIREMENTS FOR  
THE COMPETENCE OF TESTING  
AND CALIBRATION LABORATORIES

### EVALUATION TESTING



**GAI-LAP**

### CORRESPONDANCE & REPORTS PROVIDED IN

**French  
&  
English**

### MARKING



**40,000** sq.ft.  
STATE-OF-THE-ART  
LABORATORY

TEAM OF  
**65**  
HIGHLY QUALIFIED  
EXPERTS

**\$ 10 M**  
STATE-OF-THE-ART  
SPECIALIZED EQUIPMENT



**GroupeCTTGroup**

SAGEOS is a division of the CTT Group; a not-for-profit technology transfer center specialized in technical textiles, geosynthetics and flexible advanced materials.

The CTT Group employs 65 professionals:

- Ph.D. and M.Sc.A. scientists and researchers specializing in Chemistry, Civil Engineering/Geotechnical, Materials/Physics, Mechanical/Composites, Plastics/Polymers and Textiles;
- Engineers with backgrounds in Textiles, Mechanical, Electrical, Civil, Geotechnical, Electronic, Polymers, and Microbiology;
- Technicians holding technical degrees in Civil, Textile, Polymer, Pharmaceutical and other related fields.

# SERVICES

## CHARACTERIZATION AND PERFORMANCE

- Physical: Mechanical, abrasion and bending
- Chemistry: Fibre analysis, finishing products
- Optical and electronic microscopy
- Creep, long term properties
- Durability resistance to accelerated aging
- Testing in controlled thermal environment (-70°C to +250°C)
- Volatile organic compounds (VOCs)
- Toxicity

## CERTIFICATION, CONFORMANCE AND THIRD PARTY EVALUATIONS

- Standards & specifications compliance assessment
- Analysis of the causes of failure / forensic investigations
- Testing for ICC or CCMC evaluations
- CE Marking

## RESEARCH & DEVELOPMENT

- Eligible for federal and provincial programs in R&D funding (Canada)
- Assistance in finding R&D funding (Canada)

# EQUIPMENT & RESOURCES

## STATE-OF-THE-ART EQUIPMENT

- Tensile and compression testing machines: long spans, 0.5kN to 300kN capacity, Demgen clamps, Instron and Zwick
- Tensile testing machines with high resolution contact extensometers, video extensometers, Instron and Zwick
- Environmental chambers for testing at high / low temperature (-70°C to +250°C)
- Accelerated creep testing chambers (TTS / SIM)
- Multiaxial elongation and Hydrostatic Pressure, up to 5000kPa
- Several Impact Resistance Tests (Izod, Gardner, Dart...)
- Shear box / friction tester
- Porometer and several Opening size Measurement techniques (dry, wet, hydrodynamic sieving)
- Transmissivity, standard and radial
- Gradient Ratio cell
- Vapor Permeability
- Gas transmission rate
- GCL Permeability, with harsh and chemically corrosive liquids
- UV exposure: Xenon arc (4 units), Fluorescent (4 units), Carbon arc
- Stress-cracking / SP-NCTL (100+ specimens)
- Chemical compatibility tanks, testing per EPA 9090
- Microscopic Analysis (Electronic, Optic)
- OIT and HP-OIT
- Comprehensive polymer science laboratory (FTIR-ATR, DSC, with Cooling Unit [-70°C], TGA, DSC, HPLC-MS, GC-MS, Ionic Chromatography, ICP)
- Dynamic Mechanical Analyser, DMA
- Volatile Organic Compounds sampling chambers
- Spectrophotometer UV – Near Infrared
- Thermal Conductivity Analyser
- Thermal Imaging Camera

## PROTOTYPING AND SMALL SCALE PRODUCTION UNITS

- Non-Woven (Needle-Punched) with several finishing options
- Woven textiles
- 3D Weaving, 3D textiles / Dry 3D preforms
- Plasma Treatment
- Narrow Weaving Machine equipped with Jacquard Head
- Flat Knitting Machine
- E-embroidery Machine
- Warp Knitting Machine
- Smart textiles Design
- Surface treatment / Polymers (dyeing and finishing)
- Coating and lamination

## FIRE RESISTANCE LABORATORY

- Fire Resistance Evaluations:  
Accredited by ISO 17025 Transport Canada
- Radiant Panel (ASTM E162)
- Vertical Flame Test (Federal Aviation Regulation)
- Smoke Density (ASTM E662)
- Flooring Radiant Panel Test (ASTM E648)





## POLYMERIC GEOMEMBRANES

### PHYSICAL PROPERTIES

|                         |                             |
|-------------------------|-----------------------------|
| Asperity Height         | ASTM D7466, GRI GM12        |
| Density                 | ASTM D792                   |
| Thickness (PVC)         | ASTM D1593                  |
| Thickness (Smooth PE)   | ASTM D751, D5199, ISO9863-1 |
| Thickness (Textured PE) | ASTM D5994                  |
| Weight                  | ASTM D751, ISO 9864         |

### COMPOSITION / GENERAL PROPERTIES

|  |                              |
|--|------------------------------|
| Brittleness Temperature                      | ASTM D746                    |
| Carbon Black Content                         | ASTM D1603, D4218            |
| Carbon Black Dispersion                      | ASTM D5596, D3015, ISO 18553 |
| Coefficient of Thermal Expansion             | ASTM D696                    |
| Dimensional Stability                        | ASTM D1204                   |
| Extractable Content                          | EPA 600/2-88/052-App.E       |
| Extraction                                   | ASTM D3421                   |
| Hardness                                     | ASTM D2240                   |
| Melt Index                                   | ASTM D1238, ISO 1133         |
| Microscopic Analysis                         | --                           |
| OIT  | ASTM D3895, EN728            |
| HP-OIT                                       | ASTM D5885                   |
| PVC Plasticizers (Content, Molecular Weight) | ASTM D2124                   |
| Volatile Loss                                | ASTM D1203                   |
| Water Extraction                             | ASTM D1239, D3083            |

### BARRIER PROPERTIES

|                               |                            |
|-------------------------------|----------------------------|
| Water Vapor Transmission Rate | ASTM F1249, E96 (A, B, BW) |
| Water permeability            | EN 14150                   |
| Gas permeability              | ASTM D1434, ISO 15105      |
| Oxygen Transmission Rate      | ASTM D3985                 |

### MECHANICAL PROPERTIES

|  |                            |
|--|----------------------------|
| 2% Secant Modulus                      | ASTM D5323                 |
| Adhesion of Coating                    | ASTM D751, D903            |
| Flexural Strength (2 directions)       | ASTM D790                  |
| Grab Tensile (Reinforced Geomembranes) | ASTM D751, D7004           |
| Hydrostatic Resistance                 | ASTM D751A                 |
| Impact                                 | ASTM D746                  |
| Pin Puncture                           | ASTM D4833, FTMS 101C/2065 |

|                                   |   |
|-----------------------------------|---|
| Pyramidal Puncture                | ASTM D5494, EN 14574                        |
| Seams (PE)                        | ASTM D6392, D4437, D6214, ASTM D3083, D4545 |
| Seams (Tape)                      | ASTM D7272                                  |
| Seams (PVC)                       | D882 mod., D7408                            |
| Seams (Reinforced)                | ASTM D751, D7747 (Strip) D7749 (Grab)       |
| Tear (unreinforced)               | ASTM D1004                                  |
| Tear (Reinforced)                 | ASTM D751, D5884                            |
| Tensile (Multiaxial)              | ASTM D5617, ISO 14151                       |
| Tensile (PE)                      | ASTM D6693, ISO 527                         |
| Tensile (PVC)                     | ASTM D882                                   |
| Tensile (Reinforced)              | ASTM D751, D7003 (Strip), D7004 (Grab)      |
| Tensile (Wide Width - 10 % / min) | ASTM D4885                                  |
| Tensile With Extensometer         | ASTM D638                                   |

### PERFORMANCE & DURABILITY

|   |                                      |
|---|--------------------------------------|
| Guidelines for the assessment of durability   | ASTM D5819, ISO 13434, EN 12226      |
| Chemical Compatibility                        | ASTM D5747, D5322, EPA 9090          |
| Chemical resistance for landfill applications | EN 14414                             |
| Hydrostatic Puncture / Truncated Cones        | ASTM D5514                           |
| Interface Shear Strength                      | ASTM D5321, ISO 12957-1              |
| Low Temperature Bend Test                     | ASTM D2136                           |
| Resistance to oxidation                       | ISO 13438, EN 14575                  |
| Resistance to leaching                        | EN 14415                             |
| Oven Aging                                    | ASTM D5721                           |
| Microbiological Resistance / Soil Burial      | ASTM G160, D3083, EN 12225           |
| Stress Cracking Resistance                    | ASTM D5397, EN 14576                 |
| UV (Fluorescent)                              | ASTM D7238, G154, GRI GM11, EN 12224 |
| UV (Xenon)                                    | ASTM D4355, G155, ISO 4892           |

### MATERIAL SPECIFICATIONS AND TEST SELECTION GUIDES

|  |       |
|--|-------|
| Guide for Selection of Rate of Fluid Permeation Through Geomembranes | D5886 |
| Guide for Flexible Polypropylene Geomembranes                        | D6434 |
| Guide for Mechanical Attachment to Penetrations or Structures        | D6497 |
| Guide for EPDM Geomembranes  | D7106 |





|   |          |
|---|----------|
| Specification for PVC Geomembranes                              | D7176    |
| Specification for EPDM Geomembrane                              | D7465    |
| Specification for fPP-R and fPP Geomembranes                    | D7613    |
| Guide for Selecting Test Methods for Geomembrane Seams          | D7700    |
| Practice for Electrical Leak Location - Water Lance System      | D7703    |
| Characteristics / construction of reservoirs and dams           | EN 13361 |
| Characteristics / construction of canals                        | EN 13362 |
| Characteristics / tunnels and underground structures            | EN 13491 |
| Characteristics / liquid waste disposal sites or transfer sites | EN 13492 |
| Characteristics / solid waste storage and disposal sites        | EN 13493 |
| Characteristics / transportation infrastructures                | EN 15382 |

## GEOSYNTHETIC CLAY LINERS (GCL)

### PHYSICAL PROPERTIES

|  |                        |
|--|------------------------|
| Thickness                                | ASTM D5199, ISO 9863-1 |
| Weight, Water Content, Bentonite Content | ASTM D5993, ISO 9864   |
| Weight (Geotextiles)                     | ASTM D5261             |

### PROPERTIES OF THE MINERAL FRACTION

|                               |            |
|-------------------------------|------------|
| Swell Index                   | ASTM D5890 |
| Fluid Loss                    | ASTM D5891 |
| Water absorption of bentonite | ISO 10769  |

### MECHANICAL PROPERTIES

|                               |                              |
|-------------------------------|------------------------------|
| GCL Tensile                   | ASTM D6768, D4632            |
| Wide Width Tensile properties | ASTM D4595, ISO 10319        |
| Peel Strength                 | ASTM D6496, ASTM, D4632 mod. |
| Puncture (50mm Probe)         | ASTM D6241, ISO 12236        |
| Tensile Strength (Grab)       | ASTM D4632                   |

### HYDRAULIC PROPERTIES

|                                |                         |
|--------------------------------|-------------------------|
| Hydraulic Conductivity (Water) | ASTM D5887, ASTM, D5084 |
| Clay geosynthetic barriers     |                         |
| Permeability to gases          | ISO 10773               |



## PERFORMANCE & DURABILITY

|   |                          |
|---|--------------------------|
| Internal / Interface Shear Strength           | ASTM D6243, ISO 12957-1  |
| Large Scale Hydrostatic Puncture              | ASTM D5514               |
| Guidelines for the assessment of durability   | ASTM D5819, ISO/TS 13434 |
| Chemical Compatibility (Mineral Fraction)     | ASTM D6141               |
| Hydraulic Conductivity (With Contaminants)    | ASTM D6766               |
| Chemical Compatibility                        | SAGEOS GC001             |
| Chemical resistance for landfill applications | EN 14414                 |

## MATERIAL SPECIFICATIONS AND TEST SELECTION GUIDES

|   |            |
|---|------------|
| Manufacturing Quality Control                                   | ASTM D5889 |
| Acceptance testing of GCL                                       | ASTM D6495 |
| Guide for consideration when evaluating Direct Shear Results    | ASTM D7702 |
| Characteristics / construction of reservoirs and dams           | EN 13361   |
| Characteristics / construction of canals                        | EN 13362   |
| Characteristics / tunnels and underground structures            | EN 13491   |
| Characteristics / liquid waste disposal sites or transfer sites | EN 13492   |
| Characteristics / solid waste storage and disposal sites        | EN 13493   |
| Characteristics / transportation infrastructures                | EN 15382   |

## BITUMINOUS GEOMEMBRANES

### PHYSICAL PROPERTIES

|                    |                                    |
|--------------------|------------------------------------|
| Density            | ASTM D792                          |
| Mass per Unit Area | ASTM D5261, ASTM D3776, ISO 9864   |
| Thickness          | ASTM D5199, ASTM D5147, ISO 9863-1 |

### MECHANICAL PROPERTIES

|                        |  |
|------------------------|--|
| Wide Width Tensile     | ASTM D4595, ISO 10319                        |
| Tensile                | ASTM D7275, ISO 527, EN 12311-1, NF-P-84-501 |
| Puncture Resistance    | ASTM D4833, ASTM D6241, ISO 12236            |
| Seams Shear Resistance | ASTM D7056                                   |
| Tear Resistance        | ASTM D4073, ASTM D1970                       |

### GENERAL PROPERTIES

|                                  |            |
|----------------------------------|------------|
| Coefficient of Thermal Expansion | ASTM D696  |
| Low Temperature Flexibility      | ASTM D1970 |

|                   |                      |
|-------------------|----------------------|
| Thermal Stability | ASTM D1970           |
| Water Absorption  | ASTM D1970, ASTM D95 |

### PERFORMANCE & DURABILITY

|   |                                 |
|---|---------------------------------|
| Guidelines for the assessment of durability   | ASTM D5819, ISO 13434, EN 12226 |
| Dimensional Stability                         | ASTM D1204                      |
| Hydrostatic Puncture / Truncated Cones        | ASTM D5514                      |
| Interface Shear Strength                      | ASTM D5321, ISO 12957-1         |
| Low Temperature Flexibility                   | ASTM D5147, ASTM D1970          |
| Chemical Compatibility                        | ASTM D5747, D5322, EPA 9090     |
| Chemical resistance for landfill applications | EN 14414                        |
| Resistance to oxidation                       | ISO 13438, EN 14575             |
| Resistance to leaching                        | EN 14415                        |
| Oven Aging                                    | ASTM D5721                      |
| Microbiological Resistance / Soil Burial      | ASTM G160, D3083, EN 12225      |
| UV (Fluorescent)                              | ASTM D7238, G154, EN 12224      |
| UV (Xenon)                                    | ASTM D4798, G155, ISO 4892      |

### BARRIER PROPERTIES

|                               |                              |
|-------------------------------|------------------------------|
| Water Vapor Transmission Rate | ASTM F1249, ASTM E96 (B, BW) |
|-------------------------------|------------------------------|

### MATERIAL SPECIFICATIONS AND TEST SELECTION GUIDES

|  |            |
|--|------------|
| Guide for Selection of Rate of Fluid Permeation Through Geomembranes | ASTM D5886 |
| Guide for Prefabricated Bituminous Geomembranes (PBGM)               | ASTM D6455 |
| Specification for Bituminous Geomembrane (Canal and Ditch Liner)     | ASTM D2643 |
| Characteristics / construction of reservoirs and dams                | EN 13361   |
| Characteristics / construction of canals                             | EN 13362   |
| Characteristics / tunnels and underground structures                 | EN 13491   |
| Characteristics / liquid waste disposal sites or transfer sites      | EN 13492   |
| Characteristics / solid waste storage and disposal sites             | EN 13493   |
| Characteristics / transportation infrastructures                     | EN 15382   |

## GEOTEXTILES

### PHYSICAL PROPERTIES

|  |   |
|--|---|
| Thickness                                    | ASTM D5199, D1777, ISO 9863-1, CAN/CGSB 148.1-3       |
| Thickness (Each Layer/Multilayered Products) | ISO 9863-2  |
| Thickness Under Load                         | ISO 9863-1, EN 964-1                                  |
| Weight                                       | ASTM D5261, D3776, ISO 9864, EN 965, CAN/CGSB 148.1-2 |

### FIBERS / MICROSCOPIC PROPERTIES

|                                   |                                   |
|-----------------------------------|-----------------------------------|
| Carboxyl End Group                | GRI GG7                           |
| Crimp                             | ASTM D3937                        |
| Fiber Analysis                    | ASTM D276, CAN/CGSB 14.1 to 14.18 |
| Fiber Analysis (DSC)              | ASTM E793, E794, D3417, D3418     |
| Fiber Length                      | ASTM D5103                        |
| Fibers Breaking Strength          | ASTM D3822                        |
| Microscopic Analysis (SEM, Optic) | --                                |

### MECHANICAL PROPERTIES

|                                     |                                       |
|-------------------------------------|---------------------------------------|
| Abrasion                            | ASTM D4886, ISO 13427                 |
| Burst (Ball)                        | ASTM D3787, CAN/CGSB 4.2-11.2         |
| Burst (Mullen)                      | ASTM D3786, CAN/CGSB 4.2-11.1         |
| Hydrostatic Resistance Puncture     | ASTM D751A, EN 13562                  |
| Puncture (50 mm Probe / 'CBR Test') | ASTM D4833, FTMS 101C/2065            |
| Puncture (Dynamic / cone drop)      | ASTM D6241, ISO 12236                 |
| Pyramid Puncture                    | ISO 13433, EN 918                     |
| Sewn Seam Strength                  | ASTM D5495, NF G38- 019               |
| Stiffness                           | ASTM D4884, ISO 10321                 |
| Tear                                | ASTM D1388, D5732, CAN/CGSB 148.1-14  |
| Tensile (Grab)                      | ASTM D4533, D1117, CAN/CGSB 4.2-12.2  |
| Tensile (Strip)                     | ASTM D4632, D5034, CAN/CGSB 148.1-7.3 |
| Wide Width Tensile                  | ASTM D5035                            |
|                                     | ASTM D4595, ISO 10319                 |

### HYDRAULIC PROPERTIES

|                                 |  |
|---------------------------------|--|
| Opening Size (AOS)              | ASTM D4751   |
| Opening Size (Bubble Point)     | ASTM F316, SAGEOS GX005                            |
| Opening Size (FOS)              | NFG 38017, CAN/CGSB 148.1-10                       |
| Opening Size (Wet Sieving)      | ISO 12956  |
| Number of Constrictions         | ASTM D7178   |
| Percent Open Area (POA)         | COE CW 22125                                       |
| Permeability                    | ASTM D4491, ISO 11058, NFG 38016, CAN/CGSB 148.1-4 |
| Permittivity Under Load         | ASTM D5493, ISO 10776                              |
| Resistance to Water Penetration | ISO 811, CAN/CGSB 4.2-26.3                         |





|  |              |
|--|--------------|
| Transmissivity (Radial)                | ASTM D6574   |
| Transmissivity                         | ISO 12958    |
| Water Retention Capacity               | SAGEOS GX010 |
| Behavior / Water Supply by Capillarity | SAGEOS GX011 |
| Capillarity                            | SAGEOS GX012 |
| Water Front Speed (Capillary Mats)     | SAGEOS GX013 |

### PERFORMANCE & DURABILITY

|   |                                 |
|---|---------------------------------|
| Guidelines for the assessment of durability                   | ASTM D5819, ISO 13434, EN 12226 |
| Asphalt Retention   | ASTM D6140                      |
| Biological Clogging Resistance                                | ASTM D1987                      |
| Chemical Compatibility  | ASTM D6389, D5322, ISO 12960    |
| Chemical resistance for landfill applications                 | EN 14414                        |
| Filtration, suspended solid retention, hanging bag test       | ASTM 7880                       |
| Gradient Ratio  | ASTM D5101, SAGEOS GX006        |
| Hydraulic Conductivity Ratio (Filtration)                     | ASTM D5567                      |
| Hydrostatic Puncture (Large Scale)                            | ASTM D5514                      |
| Installation Damage   | ASTM D5818, ISO 10722           |
| Interface Shear Strength                                      | ASTM D5321, ISO 12957-1         |
| Resistance to oxidation                                       | ISO 13438, EN 14575             |
| Outdoor Exposure  | ASTM D5970                      |
| Silt Fence Efficiency   | ASTM D5141                      |
| Flow Rate of Water and Suspended Solids from a Geotextile Bag | ASTM D7701                      |
| UV (Fluorescent)  | ASTM G154, EN 12224             |
| UV (Xenon)  | ASTM D4355, G155, ISO 4892      |

### MATERIAL SPECIFICATIONS AND TEST SELECTION GUIDES

|  |                    |
|--|--------------------|
| Specification for Circular-Knit Geotextile   | ASTM D6707         |
| Hybrid Geosynthetic Paving Mat Specification   | ASTM D7239         |
| Characteristics required for use in earthworks, foundations and retaining structures | EN13251            |
| Resistance to acid and alkaline liquids  | ISO 12960, EN14030 |
| Characteristics required for use in liquid waste containment projects                | EN 13265           |
| Chemical resistance for landfill applications  | EN 14414           |

## GEONETS AND DRAINAGE PRODUCTS

### PHYSICAL PROPERTIES

|  |                               |
|--|-------------------------------|
| Carbon Black Content                                   | ASTM D1603, ASTM D4218        |
| Density  | ASTM D792                     |
| Melt Index   | ASTM D1238                    |
| Thickness  | ASTM D5199, D1777, ISO 9863-1 |
| Thickness / Individual layers of multilayered products | ISO 9863-2                    |
| Mass per unit area                                     | ASTM D5261, D3776, ISO 9864   |

### MECHANICAL PROPERTIES

|                                      |                                     |
|--------------------------------------|-------------------------------------|
| Compression                          | ASTM D6364, D1621, ISO 25619-2      |
| Peel Strength                        | ASTM D7005, F904, D413, ISO 13426-2 |
| Tensile                              | ASTM D7179, D5035                   |
| WW Tensile                           | ASTM D4595, ISO 10319               |
| Vertical Compression of Geocomposite |                                     |
| Pavement Panel Drains                | ASTM D6244                          |
| Static puncture test (CBR test)      | ISO 12236                           |

### HYDRAULIC PROPERTIES

|  |                       |
|--|-----------------------|
| Transmissivity                                 | ASTM D4716, ISO 12958 |
| Vertical Strip Drains in the Crimped Condition | ASTM D6918            |



### PERFORMANCE & DURABILITY

|  |  |
|--|--|
| Guidelines for the assessment of durability                    | ASTM D5819, ISO 13434, EN 12226                                  |
| Accelerated compressive creep properties                       | ISO 25619-1, ASTM D7361  |
| Chemical Compatibility   | ASTM D6388, D5322, ISO/TR 12960                                  |
| Chemical resistance for landfill applications                  | EN 14414   |
| Interface Shear Strength                                       | ASTM D5321, ISO 12957-1 (direct shear), 12957-2 (inclined plane) |
| Resistance to oxidation  | ISO 13438  |
| UV (Fluorescent)   | ASTM G154, EN 12224  |
| UV (Xenon)   | ASTM D4355, G155, ISO 4892                                       |
| Vertical Strip Drains testing / Large Scale Consolidation Test | ASTM D7498   |
| Soil burial  | ISO 13437  |
| Resistance to oxidation  | ISO 13438  |

### MATERIAL SPECIFICATIONS AND TEST SELECTION GUIDES

|  |            |
|--|------------|
| Prefabricated Vertical Drains (PVD)                      |            |
| Guide  | ASTM D6917 |
| Edge Drains Specification                                | ASTM D7001 |
| Acceptance Testing of Geonets and Drainage Geocomposites | ASTM D7273 |
| Design guidances for PVDs                                | EN-15237   |



## GEOGRIDS

### PHYSICAL PROPERTIES

|                    |                                      |
|--------------------|--------------------------------------|
| Thickness          | ASTM D5947, D5199, D1777, ISO 9863-1 |
| Mass per unit area | ASTM D5261, ISO 9864                 |

### MECHANICAL PROPERTIES

|  |                                 |
|--|---------------------------------|
| Wide Width Tensile Properties            | ASTM D4595, D6637(B), ISO 10319 |
| Tensile Strength (Single Rib)            | ASTM D6637(A), GRI GG1          |
| Junction Strength                        | ASTM D7737, GRI GG2             |
| Flexural Stiffness                       | ASTM D1388, D5732               |
| Flexural Rigidity                        | ASTM D7748                      |
| Torsional Stiffness / Aperture Stability | ASTM WK24635 (draft)            |

### PERFORMANCE & DURABILITY

|   |                                 |
|---|---------------------------------|
| Carboxyl End Group  | GRI GG7, ASTM D7409             |
| Chemical Compatibility  | ASTM D5322, D6213, ISO/TR 12960 |
| Chemical resistance for landfill applications                 | EN 14414                        |
| Soil burial   | ISO 13437                       |
| Resistance to oxidation                                       | ISO 13438                       |
| Resistance to hydrolysis                                      | EN 12447                        |
| Concrete Blocks Shear Strength                                | ASTM D6916                      |
| Connection Strength   | ASTM D6638                      |
| Creep Properties  | ASTM D5262, ISO 13431           |
| Accelerated Creep   | ASTM D6992                      |
| Installation Damage   | ASTM D5818, ISO 13437           |
| Installation Damage (index)                                   | ISO 10722                       |
| Interface Shear Strength                                      | ASTM D5321, ISO 12957-1         |
| Intrinsic Viscosity / Molecular Weight (PET)                  | ASTM D4603                      |
| Pull-Out Resistance   | ASTM D6706, GRI GG5             |
| Small-Strain Tensile Properties / In-Air Cyclic Tension Tests | ASTM D7556                      |
| UV (Xenon)  | ASTM D4355, G155, ISO 4892      |

### DESIGN GUIDANCES

|  |                          |
|--|--------------------------|
| Guidelines for the assessment of durability                | ASTM D5819, ISO/TS 13434 |
| Long-term strength of geosynthetics for soil reinforcement | ISO/TR 20432             |

## EROSION CONTROL PRODUCTS

### PHYSICAL PROPERTIES

|                   |                   |
|-------------------|-------------------|
| Absorbency        | ASTM D1117        |
| Light Penetration | ASTM D6567        |
| Mass              | ASTM D6475, D6566 |
| Resiliency        | ASTM D6524        |
| Stiffness         | ASTM D6575        |
| Thickness         | ASTM D6525        |

### MECHANICAL PROPERTIES

|             |            |
|-------------|------------|
| Compression | ASTM D6454 |
| Tensile     | ASTM D6818 |

## SYNTHETIC TURFS, SPORT SURFACES

### PHYSICAL PROPERTIES

|                         |                  |
|-------------------------|------------------|
| Abrasiveness            | ASTM F1015       |
| Apparent Density        | ASTM D1895 (B)   |
| Component Masses        | ASTM D418, D5848 |
| Linear Density          | ASTM D1577       |
| Number of Binding Sites | ASTM D418, D5793 |
| Pile Thickness          | ASTM D418        |
| Pile Yarn Mass          | ASTM D418, D5848 |
| Total Mass              | ASTM D418, D5848 |
| Tuft Height             | ASTM D418, D5823 |

### MECHANICAL PROPERTIES

|                                |                       |
|--------------------------------|-----------------------|
| Compression Set                | ASTM D1667 (suffix B) |
| Seam Resistance                | ASTM D4884, EN 12228  |
| Tear Resistance                | ASTM D624             |
| Tensile (Elastomeric Material) | NF EN 12230           |
| Tensile (Grab)                 | ASTM D1682, D5034     |
| Tensile (Tuft / Yarn)          | ASTM D2256, ISO 4919  |
| Tuft Bind Resistance           | ASTM D1335            |

### HYDRAULIC PROPERTIES

|                    |                               |
|--------------------|-------------------------------|
| Water Permeability | ASTM D4491, F1551, DIN 18-035 |
|--------------------|-------------------------------|

### THERMAL PROPERTIES

|               |           |
|---------------|-----------|
| DSC Analysis  | ASTM E794 |
| Melting point | ASTM D789 |

### FIRE RESISTANCE PROPERTIES

|                    |                         |
|--------------------|-------------------------|
| Flammability Tests | ASTM D2859, E648, D4804 |
|--------------------|-------------------------|



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