GEOFABRICS® JOURNAL

APRIL 2011

Do product data sheets for geotextiles in Australia tell you what you need to know?

Geofabrics® uses Product Data Sheets to provide information to customers about the geotextiles supplied by it. Similarly, other companies also publish product data sheets which set out information about the geotextiles supplied by them.

In 2009, Geofabrics engaged a leading firm of consulting engineers, Parsons Brinckerhoff Australia (PBA), to test a range of geotextiles sold by various companies in Australia and to independently report on whether those geotextiles met with the published specifications about them. The testing was commissioned and paid for by Geofabrics. The testing did not concern the quality or performance of the geotextiles supplied by any company. The focus was on whether the geotextiles supplied by these companies met the specifications in the published data.

This edition of the Geofabrics® Journal looks at some of the issues highlighted in the Report and conclusions reached by PBA. We also provide our commentary thereon and explain the importance of certain technical terms used in the Report.

For further information on the 'Report on the Reliability of Published Data for Geotextiles Commercially Available in Australia' (PBA Report), by Parsons Brinckerhoff Australia, or a copy of the report itself, please contact Warren Hornsey at - w.hornsey@geofabrics.com.au

Where do I test geotextiles?

There are a number of laboratories in Australia who will conduct geotextile testing and advise on the sampling protocols, including –

Australian Wool Testing Authority - Melbourne VIC
Ph: (03) 9371 2400
Email: textiles@awta.com.au

CSIRO - Geelong VIC
Ph: (03) 5246 4755
Email: Dale.Carroll@csiro.au

Department of Main Roads Engineering & Technology Group
Ph: (07) 3115 3040
Email: andrew.s.kennedy@tmr.qld.gov.au

GEOFABRICS®

THE PARSONS BRINCKERHOFF REPORT

Geofabrics provided a brief to PBA to report on whether geotextiles sold by various companies met with published data about them. A copy of this brief is attached to the PBA Report and can be provided on request.

PBA was responsible for sampling the products, testing (or arranging testing) and preparing the report.

PBA also ensured that its testing was conducted in accordance with the relevant Australian Standards. Details of those standards can be found in the PBA Report or can be provided on request.

Testing was independently carried out. The test results were collated and reviewed by PBA. The comparisons in the PBA Report were made by PBA.

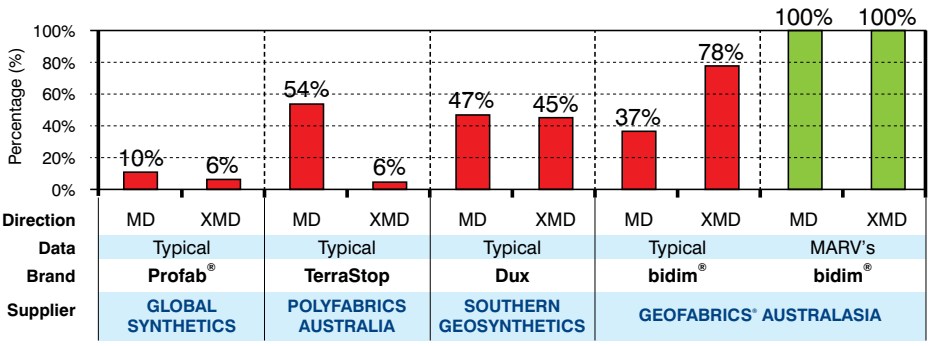
PBA then presented its report together with its conclusions and findings.

The following extracts from the PBA Report (and Geofabrics's brief to PBA) help explain PBA's approach:

- "The program brief included ensuring the confidential purchase of geotextile of various grades from a range of suppliers in Australia".
- "An individual roll of each grade selected was to be purchased with receipts retained and labels on each roll, clearly stating the grade of geotextile."
- "Data sheets were to be requested from the suppliers with product specifications and Minimum Average Roll Values (MARV)."
- "The confidential nature of this project was seen as critical, with the integrity of the results dependant on each sample being representative of the commercially available sample of geotextile being obtained from each supplier."
- "Testing of the geotextile was undertaken by the Australian Wool Testing Authority (AWTA).The AWTA are a National Association of Testing Authorities (NATA) registered, independent laboratory."
- "The AWTA is an accredited testing authority and as such carried out preparation and processing of specimens in accordance with Australian standards."

The PBA Report deals extensively with the test results of the samples purchased from various Australian suppliers of geosynthetics. Geofabrics® has extracted the data from the PBA Report and summarised it in the graph below

Table 1: Percentage of property test results meeting published data



At least 6 grades of geotextile per supplier were tested. The properties tested are as follows:

- AS3706.2 Wide strip tensile strength
- AS3706.3 Trapezoidal Tear Strength
- AS3706.4 CBR Burst Strength
- AS2001.2.2 Grab Tensile strength
- AS3706.9 Flow rate

MD = Machine Direction
XMD = Cross Machine Direction

Typical – the arithmetic mean of a set of results. This implies that 50% of the tested specimens will typically exceed this value and 50% will typically not meet this value.
MARV – the mean or typical value less 2 standard deviations. Mathematically it is implied that 97.5% of the tested specimens will exceed the Minimum Average Roll Value.

Note: *Where sample orientation was not applicable (i.e. CBR Burst and Flow Rate), these values were included in machine direction results.*

Table 2: Extent to which test results varied from published data

Supplier	Brand	Findings
GLOBAL SYNTHETICS	**ProFab**	78% of test results were 25 to 75% below the published **typical** data[1] for the properties shown in table above.
POLYFABRICS AUSTRALIA	**Terrastop**	52% of test results were 0 to 25% below the published **typical** data[2] for the properties shown in table above.
SOUTHERN GEOSYNTHETICS	**Dux**	78% of test results were 0 to 25% below the published **typical** data[1] for the properties shown in table above.
GEOFABRICS® AUSTRALASIA	**bidim**	46% of test results were 0 to 25% below the published **typical** data[3] for the properties shown in table above.
GEOFABRICS® AUSTRALASIA	**bidim**	100% of test results were above the published **MARV** data[3] for the properties shown in table above.

1. *Single **typical** data published with no indication of strength direction.*
2. *Single **typical** data published in the machine direction only (cross machine direction strengths were weaker than the machine direction strengths).*
3. *Both **typical** and **MARV** data published in both machine and cross machine direction.*

Parsons Brinckerhoff Australia's comments and our observations

We comment on them as follows:

- **PBA Comments:** "The typical value provides a mean number, one in which 50% of test values will fall below the typical value and 50% above. By this definition, a typical value is not usable information for design purposes. An engineer has no guarantee that the geotextile specified could actually reasonably meet the criteria it has been selected for."

  Geofabrics' Observations: *We endorse this conclusion and our geotextile data sheets provide MARV values to give design engineers the certainty they require. Design engineers should request this information from geotextile distributors so as to ensure the integrity of their projects. The report reveals that individual property test results were up to 75% below specified data.*

- **PBA Comments:** "The data sheets, although generally easy to obtain from suppliers were difficult to interpret, (due to the) variability in the quality of information presented. In some instances it was not specified whether the published data was presented in MD or XMD. This has a significant impact on the validity of published data, given that generally a product will produce stronger results in the MD. The critical direction will therefore be the XMD for design, yet most specifications failed to provide data for this direction."

  Geofabrics' Observations: *The importance of this conclusion cannot be under estimated particularly in the light of the Report's findings regarding the material differences in MD and XMD strengths. Design engineers should request that this information be supplied by the geotextile manufacturers and that the information provide details of the internationally accepted testing regime under which it is tested.*

- **PBA Comments:** The variation in test results was found to be significant, with one product failing to meet the published data by 76%. Based on the test results presented in this report, the specified data sheets cannot be fully relied upon for design purposes or that the product selected will perform as expected on site."

  Geofabrics' Observations: *The Report found that 100% of Geofabrics' products met or exceeded Geofabrics' published MARV specifications. Geofabrics is committed to providing accurate and meaningful information about its products to engineers and customers.*

- **PBA Comments:** "Published MARV values achieved a 100% rate of equaling or exceeding the test results. This is an ideal outcome for design purposes, given that almost all engineering design is based on the minimum expected properties of a material. These results indicate that using MARV values published in both MD and XMD would provide an excellent platform on which to base engineering design however only Geofabrics provide MARV values."

  Geofabrics' Observations: *This conclusion vindicates our publication of MARV values and strengths in both MD and XMD. The publication of this information and the accompanying certification that the geotextile supplied is in accordance with the specification provides design engineers with the certainty they require.*

- **PBA Comments:** "A standardisation of what is required from published data sheets would assist engineers greatly, providing confidence that the geotextile will meet the criteria used for design. The reliability of designs upon application in the field would also be increased as the appropriate geotextile would be selected for the job. Design certainty could be achieved through the use of MARV values as opposed to typical values, with both MD and XMD values presented."

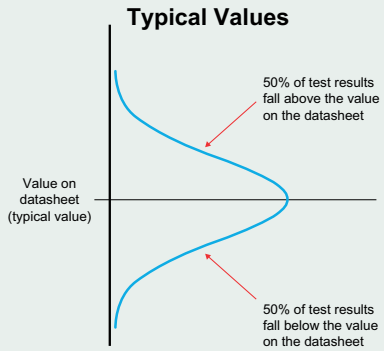
  Geofabrics' Observations: *We endorse and support this conclusion. We believe that design engineers have the right to demand this information, in a certified form, and it should become the standard for geotextile suppliers in Australia.*

Definitions

Typical Values

A typical value refers to the arithmetic mean value of a set of test results. An arithmetic mean is the value that is derived when 50% of the test results are above this value and 50% fall below this value.

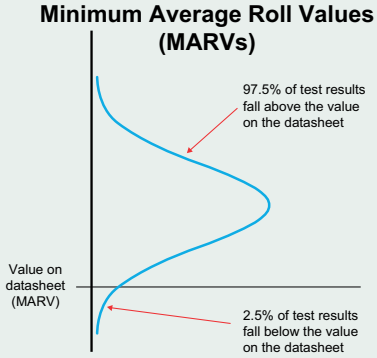
Geofabrics' comment: *This is a traditional form of specification for geotextiles and provides a 50% confidence level that any sample taken during quality assurance testing will exceed the value reported. By extension, 50% can be expected to fall below the typical value published by the manufacturer. Unfortunately this method of specification gives no indication of the variation in the data used to obtain the typical value.*



Minimum Average Roll Value ("MARV")

The MARV value is derived from the typical value. It represents two standard deviations less than the typical value. Therefore a MARV value indicates that 97.5% of tested geotextile samples will exceed the MARV value.

Geofabrics' comment: *MARV is an internationally accepted method for presenting geosynthetic data to avoid possible confusion between the use of absolute minimum values and the use of typical (or average) values. MARV specifications provide designers with 97.5% confidence that the geotextiles will meet or exceed the manufacturer's published values*



Machine direction (MD)

Machine direction (MD) refers to the direction in a machine-made fabric, parallel to the direction of motion of the material through the processing machine. Practically this refers to testing along the length of the roll.

Cross Machine direction (XMD)

Cross machine direction (XMD) refers to the direction in a machine-made fabric, perpendicular to the direction of motion of the material through the processing machine, therefore tests are conducted across the width of a roll.

Geofabrics' commentary on the importance of Machine Direction and Cross Machine Direction Values

Geotextiles are sometimes incorporated into road or railway formations to improve the performance of the pavement layers. This is achieved by providing one or all of the following functions:

- Separation;
- Filtration;
- Reinforcement;

To continue the provision of these functions for the life of the road or rail structure, the geotextile selected must be sufficiently robust to resist the loads applied during construction and the service life.

Importantly, any load will be distributed radially (Figure 1) through the formation layer onto the geotextile. In road applications, lane changes and turning vehicles will produce varied load patterns.

The minimum strength of the geotextile must therefore be known to allow for the application of forces in all directions to be considered by the design engineer.

Geotextile strengths are not necessarily the same in all directions. Depending on the method of manufacture and the equipment used in their manufacturing, there can be large variations between the Machine Direction (MD) and Cross Machine Direction (XMD) strengths (Figure 2). This was an important finding of the Report. All high quality geotextile manufacturers should test the geotextile strength characteristics in both MD and XMD and use the values to determine minimum or MARV data for their products.

Not all data sheets published by Australian distributors specify the strength in both directions and the PBA Report highlights the wide variation in presentation of this data.

The inconsistency in the presentation of this important data means that a design engineer may not have all the information he requires to make an informed decision. The Report shows that there is a great discrepancy in how the data is presented,

- with one supplier publishing a data sheet with no typical values for the cross-machine direction,
- another supplier not stating whether their published typical values are for the machine or cross-machine direction.

Clearly these data sheets are deficient in that they do not provide the designer with the actual strength of the geotextile in both directions - essential for a designer to minimise the risk in their design process.

Figure 1. Vehicle Load Distribution

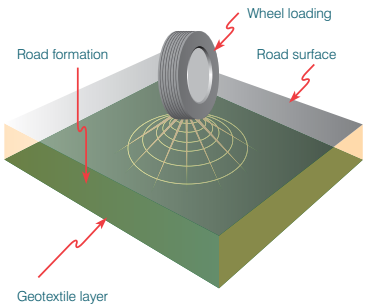


Figure 2. Geotextile Direction Terms