TECHNICAL INFORMATION BULLETIN 1

Technical Specification of Contract Carpets

CARPET INSTITUTE *– of –* AUSTRALIA LIMITED

TECHNICAL INFORMATION BULLETIN NUMBER ONE

Contents

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INTRODUCTION

This bulletin will help commercial buyers to recognise and describe features of carpet and carpet performance through specification.

To avoid restricting the potential sources of supply, specifications should be as openly written as possible. The Carpet Institute of Australia favours an approach where the essential characteristics of the carpet forms the primary specification. This will usually eliminate a range of carpets that are unsuitable to the end-user/consumer.

In addition to the essential characteristics of the carpet, other information on carpet construction and carpet performance may be requested. If so, it should form part of the complete specification.

All information requested by the tender should be capable of being tested or assessed by an independent and accredited testing authority.[1]

This bulletin lists specification information under two headings:

1. Essential information to the tender
2. Additional information that may be requested by the tenderer

For certain projects, the specifier may consider items under "2" as additional essential information.

STANDARDS AND TEST METHODS

Relevant Australian Standards are referenced throughout this bulletin. A complete list of Australian Standards referred to is provided in Appendix A. Copies of these Standards can be purchased from the Standards Australia office in each State capital city.

TEXT BOX 1 - APPEARANCE RETENTION IN CARPETS

Appearance Retention describes overall product performance. It refers to the ability of a carpet to retain an acceptable level of appearance over time.

Appearance change in carpets can have a number of forms including flattening, alterations in texture or structure, soiling and staining, loss of pattern and colour change.

Some degree of appearance change and abrasive wear will occur in any carpet as it is used. These changes are part of the natural ageing process that commences as soon as a carpet is installed. Change in appearance is not a defect, and is unacceptable only if it occurs prematurely or excessively.

There is no objective measure of acceptable appearance retention, although some tests measure elements of simulated appearance change. For example, The Hexapod Tumbler Test simulates the in-service behaviour of carpet by subjecting a sample to a tumbling heavy mass rotating inside a revolving drum lined with the test sample. The test simulates aspects of colour and texture change caused by foot traffic.

1 In Australia, by the National Association of Testing Authorities. International equivalents apply in other countries.

1. Essential Information Required

1.1 MANUFACTURING PROCESS

The various manufacturing processes can produce carpets with quite different features.[2] The major variables in construction relate to design flexibility, performance features and also cost. The major products/processes are:

- Tufted carpet - from the broadloom tufting process
- Woven carpet - from the Axminster and Wilton weaving processes
- Bonded carpet - from U-Bond and I-Bond processes
- Needlepunch carpet - from the needleloom/needlepunch process

Modular carpet (carpet tile) is usually constructed from tufted or bonded carpet which is adhered to a stiff resilient backing material and then cut into tile shape.

Further information on manufacturing processes and carpet products is contained in AS 2454.

1.2 SURFACE APPEARANCE (STYLE)

The most frequently specified surface texture/appearance styles[3] are:

- Level Loop
- Cut and Loop
- Level Cut
- High and Low Loop
- Tip Sheared Loop

Further information on carpet surface style is contained in AS 2454.

1.3 DIMENSIONS

Carpets are manufactured to different widths, the useable width[4] depending on the size and type of the loom used in the manufacturing process.

Standard broadloom widths are 3.66 metres (m) and 4.0m

Narrow-loom widths (usually woven only) are 0.69m, 0.9m, 1.0m, 2.0m

AS 1385 specifies the following commercial tolerances for the dimensions of tufted and woven carpet:
Useable Width: ± 1.5%
Length: 0 + 2%

Standard dimensions for modular carpet (carpet tiles) are: 0.5m x 0.5m, 0.6m x 0.6m. Other dimensions can be specified. Tolerance (all directions): ± 0.4%

Note: Special widths may be required where access to the installation site is restricted. For example in multi-storey buildings, 3.66m width rolls may not be transportable in some elevator cars.

1.4 COLOUR AND DESIGN

Colours should be specified and matched in an agreed light source to an agreed tolerance. The design will be specified, for example:

- Plain
- Pattern
- Stipple
- Berber
- Heather
- Sisal

1.5 QUANTITY

For an accurate assessment of the area to be carpeted, detailed building floor plans should be made available. The total installation area and carpet required for the installation should be stated according to the requirements of AS 2455.

Additional factors to be considered when assessing quantity requirements include:

- dye lots - carpets from different dye lots must not be mixed in adjacent areas;
- laying losses - an allowance must be made for additional carpet consumed in laying;
- pattern matching - an allowance will be necessary for pattern matching.

2 The specification should only exclude a manufacturing process that is ***not*** acceptable. If a particular process is specified it may unnecessarily restrict the number of manufacturers/suppliers and limit choice.

3 Same comment applies as Footnote 2. Exclude only styles that are ***not*** acceptable.

4 The useable width of a carpet is the width of the pile surface that can be effectively used on the floor.

1. Essential Information Required

1.6 METHOD OF INSTALLATION

Different installation methods can be used for most carpets. They include the conventional carpet gripper system, the direct-stick system, and the double-bond system. Detailed descriptions of alternate installation systems are contained in AS 2455. Other specialist installation methods are also available for certain products, and for certain installation conditions. If the preferred method of installation is known at the time of issuing the tender, it should be clearly stated. Alternatively, the carpet manufacturer can recommend the most suitable laying procedure for their product.

Installation must be in accordance with the requirements of AS 2455 unless otherwise agreed. Carpet underlay used in the installation should meet the requirements of relevant performance standards.[5]

1.7 PILE FIBRE COMPOSITION

Wool, nylon (or polyamide) and polypropylene (or polyolefin) are the major fibres used in Australia to make carpet yarns and carpet. Other fibres used include acrylic and polyester. Different fibres can also be blended to produce mixed fibre carpet yarns, the most common being 80%/20% wool/nylon carpet yarn. Blending of yarns is used to achieve certain performance and economy requirements. Manufacturers can advise on appropriate blends as necessary.

For blended yarns, blend proportions should conform to the tolerances and allowances set out in AS 2622 (see Text Box 2). Percentages are expressed as Commercial Standard Regain[6] of the respective fibres.

Fibres can be either new or recycled. If a recycled fibre is being used, the percentage should be clearly stated. Wool fibres with an average fibre diameter of 33 micron or greater are recommended.

For complete information on fibre content labelling and commercial tolerances refer to AS 2622.

1.8 EXTRACTABLE MATTER OF PILE

All carpet yarns contain small amounts of residual oil, wax or grease. Some of these residues are inherent to the fibre and some are applied as processing lubricants during yarn and carpet manufacturing. Excess residual matter may lead to premature soiling problems in the installed carpet. Accordingly, maximum levels of extractable matter for each fibre type should be specified.

When the pile is extracted in accordance with AS 2001.3.4, the volume of extractable matter should not exceed the following maximums:

- Wool - 1.5% of total weight
- Nylon / Polyamide - 1.0% of total weight
- Polypropylene / Polyolefin -1.0% of total weight
- Acrylic - 1.0% of total weight
- Polyester - 1.0% of total weight

If the pile yarn is a blend of two or more fibres, extractable matter for the blend is proportionate to the blend.

Example: 80% Wool / 20% Nylon = 0.8*1.5% + 0.2*1.0% = 1.4% maximum.

TEXT BOX 2 - TOLERANCES AND ALLOWANCES - PILE FIBRE COMPOSITION

The following tolerances and allowances apply to pile yarn or other use-surface material of a textile floor covering.

For textile floor coverings that have been manufactured from two types of fibre, the differences between the percentages stated on the label and those determined using the specified methods of measurement should not be greater than 5% of the total mass of the pile fibre or use-surface material from which the product has been made.
For example, the fibre content of a textile product labelled 80% wool / 20% nylon should be permitted to vary between measured contents of 75% wool / 25% nylon and 85% wool / 15% nylon.

For textile products that have been manufactured from more than two types of fibre, this allowance should be calculated based on the two dominant fibres in the blend and the amount of the other(s) adjusted to suit.
For example, the fibre content of a textile product labelled 65% wool / 20% polyester / 15 % rayon should be permitted to vary between measured contents of 60 % wool / 15% polyester / 25% rayon and 70% wool / 25% polyester / 5% rayon.

Where the pile yarn or other use-surface description on the label of a textile floor covering refers to one fibre only accompanied by the word "ALL" or "pure", it should be interpreted that the material contains at least 95% of that fibre.

Where the pile yarn or other use-surface description on the label of a textile floor covering refers to one fibre only accompanied by the word "100 per cent", any inadvertent impurities present up to a maximum of 3 per cent of the total fibre described, may be ignored.

5 At the time of writing, Interim Standard AS 4288 (Soft underlays for textile floor coverings) was being trialed.

6 Commercial Standard Regain is the ratio of the mass of ambient moisture in the fibre compared to an oven dry mass. Commercial Standard Regain Allowances for the major carpet fibres are shown in section 2.3. Standard Conditions requires testing of the specimen, and reporting of results, at standard atmospheric conditions of 20° Celsius (+/- 2) and 65% Relative Humidity (+/- 2).

1.9 COLOURFASTNESS

Colourfastness is the ability of a textile floor covering to maintain its original colour after contact with various agents to which the materials may be exposed during manufacture and in subsequent use. These agents include light, wet rubbing, dry rubbing, dry cleaning solvent and shampoo solution.

1.9.1 Colourfastness to Light

When tested in accordance with ISO 105/B02 all colours in the pattern shall have a minimum rating of 5.

1.9.2 Colourfastness to Water

When tested in accordance with AS 2001.4.8, a composite sample containing all colours shall have a minimum rating of 3 - 4.

1.9.3 Colourfastness to Shampoo Solution

When tested in accordance with AS 2111.19.2, a composite sample containing all colours shall have a minimum rating of 3 - 4.

1.9.4 Colourfastness to Rubbing

When tested in accordance with AS 2111.19.1, a composite sample containing all colours should have a minimum rating of 3 - 4 to both wet and dry rubbing.

1.9.5 Colourfastness to Dry Cleaning Solvents

When tested in accordance with AS 2001.4.16, using perchlorethylene or white spirit, a composite sample containing all colours should have a minimum rating of 3 - 4.

It is important to note that certain colours on some fibres cannot be produced with commercially available dyestuffs to meet the specifications outlined in 1.9.1 to 1.9.5. In these cases, the manufacturer must report the expected performance of the fibre/colour in each colourfastness test. If the carpet is unsuitable for cleaning with solvent, instructions to the customer, tenants and cleaning staff are essential.

1.10 INSECT RESISTANCE TREATMENT

Where yarns used in the carpet are wool or wool blends, the pile fibre should be treated against moth and carpet beetle attack by applying an approved insecticide in accordance with the recommendations of the International Wool Secretariat. When tested in accordance with AS 2001.6.1 a 'Satisfactory' result must be recorded.

1.11 SURFACE PILE MASS PER UNIT AREA

Surface Pile Mass (SPM) is the mass of pile in a given area that protrudes above the backing and forms the pile or wear surface of the carpet. SPM is an important determinant of overall carpet performance, particularly as it relates to construction density. SPM is obtained by shearing the carpet pile down to the substrate/backing and weighing the pile that is removed. When tested in accordance with AS 2111.4, the mean value should be within minus 5% of the specified weight. Should the mean value obtained be within minus 10% of the specified weight, the manufacturer is entitled to request a retest on the remaining sample or a new sample drawn in accordance with AS 2119. The mean of the first test and the retest should then be accepted as the true result unless there is reason to suspect that either result is in error. The tender should state whether Surface Pile Mass is to be measured and reported according to Commercial Standard Regain or Standard Condition.

It should be noted that some carpets may not be suitable for specification in terms of Surface Pile Mass per unit area because of the difficulty in determining the interface between the carpet pile and the backing material. These include needlepunch carpets, some tufted carpets manufactured with a non-woven primary backing or uneven interface and bonded carpets.

1.12 TOTAL PILE MASS PER UNIT AREA

Total Pile Mass of a carpet is the mass of pile yarn in a given area, including the area forming the base of the tufts, or held in the substrate. The Total Pile Mass of a woven or tufted carpet is best determined by dissecting an unbacked sample of the carpet. The specifier may require an unbacked sample (the griege or carpet cloth) from the manufacturer for this purpose. Samples should be tested in accordance with AS 2111.11 (Complete Dissection Method). When tested to 2111.11, the mean value should be within minus 5% of the specified weight. Should the mean value obtained fall within minus 10% of the specified weight, the manufacturer is entitled to a retest on the remaining sample or a new sample drawn in accordance with AS 2119. The mean of the first test and the retest will then be accepted as the true result unless there is reason to suspect that either result is in error.

The specification should state whether Total Pile Mass is to be measured and reported according to Commercial Standard Regain or Standard Condition. The relationship between Surface Pile Mass and Total Pile Mass per unit area may be significantly affected by normal manufacturing variations in, for example, yarn count, pile height, stitch rate and design factors.

1. Essential Information Required

1.13 PILE THICKNESS

Pile Thickness is the measured thickness of the carpet pile above the substrate/backing.

When tested in accordance with AS 2111.5, the Pile Thickness above the backing should be that specified ± 1mm.

In multi-pile height carpet (eg, carpets that incorporate a pattern or texture effect by using different pile heights), the maximum and minimum pile thickness should be specified.

1.14 BOND STRENGTH BETWEEN BACKINGS

Bond Strength refers to the amount of force, measured in Newtons, that is required to separate the primary and secondary backing materials. For carpets with a secondary backing, the mean Bond Strength, tested to AS 2111.16, should be 40 Newtons or greater in both machine and cross directions.

Note: A 40 Newton mean can be difficult to achieve in certain constructions and styles of tufted carpet. For example, where particular latex formulations are required, where certain backing materials are used, or where the product design incorporates significant cross-over stitching. In these situations, the specifier should discuss these factors with the carpet manufacturer beforehand and agree on an appropriate Bond Strength figure. In the examples listed above, a 30 Newton mean is usually sufficient to achieve satisfactory performance.

Note: Under AS 2111.16, numerical results are sometimes not returned due to tufts pulling through the primary interface during the test procedure. When this occurs, the test method requires the result (* *) to be recorded. This result indicates that the backing materials are unlikely to delaminate when the carpet is in service.

1.15 TUFT SECURITY

Individual tufts or legs of yarn are secured into the carpet substrate or backing material with an adhesive, usually synthetic latex. Tuft security measures the force, in Newtons, required to removed the tuft or leg of yarn from the substrate. The mean force to remove an individual tuft or loop, when tested in accordance with AS 2111.15, should be specified.

Tuft security requirements vary according to the carpet construction and the type of use. As a guide the following mean values are often specified for commercial/contract grades of carpet:

- Cut pile carpet - 6 Newtons
- Loop pile carpet (woven) - 10 Newtons
- Loop pile (tufted - secondary backed) - 30 Newtons

Note: Some Woven-Wilton construction carpets that are known to perform satisfactorily in commercial/contract applications may not meet the above minimums.

TEXT BOX 3 - SPECIFIER RESPONSIBILITIES

Prototype Tender Sample

The specifier should submit with the tender a sample of carpet of similar construction and colour to that upon which the tender is based. The specifier should state the respects in which the prototype sample might differ from the requirements of the tender.

Production Samples

The specifier may be requested to submit a full width sample of finished carpet with a minimum area of 2 square metres from one or more production runs for testing. A portion of this sample should be retained for reference in case of variation of colour, texture, or other visual or tactile qualities. Other samples (eg, unbacked carpet) may also be required for testing purposes.

Warranty in Lieu of Testing

In cases where the cost of complete testing cannot be justified, the specifier may choose to call for a warranty that the carpet delivered will meet the requirements and reserve the right to spot check any or all of the parameters if a problem arises in service. An unused sample should be retained.

Specification and Non-Conformance

Where there is non-conformance to the specification, discussion should take place with the manufacturer/supplier. The manufacturer/supplier should be responsible for costs associated with retesting as a result of non-conformance.

2. Additional Information Requirements

2.1 METHOD OF YARN MANUFACTURE

Yarns used to make carpets can be manufactured from continuous filaments of fibre or from short lengths of fibre that are spun together to form a continuous length of yarn. The method of yarn manufacture may be requested, for example:

- woollen spun system
- semi-worsted spun system
- continuous filament system
- other (to specify)

2.2 YARN PLY

Yarn Ply refers to the number of single ends of yarn that are folded or twisted together to form a multi-ply yarn. Where information on Yarn Ply is requested, it should be in the form described in Section 2.4.

2.3 YARN COUNT

The Yarn Count is the linear density of a fibre or yarn and is expressed as weight in grams per 1000 metres. The Yarn Count must include the Resultant Tex - ie, the weight in grams of the finished yarn taking into account the effects of twist and ply. Resultant Tex is recorded at the Commercial Standard Regain allowance for each fibre.

The Commercial Standard Regain allowance for each fibre is:

- Wool - 16.0%
- Nylon - 6.25%
- Polyester - 1.5%
- Acrylic - 2.0%
- Polypropylene - 2.0%
- Viscose Rayon - 13.0% (all forms)

Recommended test method: AS 2001.2.23
Tolerance: ±10%

Note: There is a functional relationship between Total Pile Mass, Pile Thickness, Tuft Density and Yarn Count. It may not therefore be possible to specify all four parameters individually. It is usual practice to only specify Surface Pile Mass or Total Pile Mass, Pile Thickness and Tuft Density. These variables will determine Yarn Count.

2.4 YARN TWIST LEVEL

Multiple yarns are made of single yarn ends that are folded or twisted together. Yarn Twist Level is a measure of turns or twists per metre length of the yarn.

Recommended test method: AS 2001.2.14
Tolerances: singles ±15%
folded ±10%

2.5 TUFT DENSITY

Tuft Density is the number of tufts per unit area of the carpet. The number of tufts are measured along two plains: firstly, the direction of manufacture; and secondly, the plain of tuft insertion.

2.5.1 Tufts Parallel to Selvedge

This test records the number of tufts per 100mm in the direction of manufacture (tufts parallel to selvedge).

Recommended test method: AS 2111.9
Tolerance: +10%

2.5.2 Tufts Perpendicular to Selvedge

This test records the number of tufts per 100mm perpendicular to the selvedge. In tufted carpets this figure is determined by, and will closely approximate, the gauge of the tufting machine.

Recommended test method: AS 2111.9
Tolerance: -5%

TEXT BOX 4 - YARN EXPRESSION

To ensure that the information on Yarn Count, Yarn Twist and Yarn Ply are unambiguous they should be stated in the following standard form:

{singles count (tex)}:{twist and ply}:R{resultant count (tex)}

The twist and ply are expressed in this way:

{singles twist direction} {singles twist level (turns per metre)} x {ply number}
{folding twist direction} {folding twist amount (turns per metre)}

For example, a typical 2 ply BCF nylon yarn may be specified as: ***109 tex: Z 145 x 2 S 145: R275 tex***

A typical 3 ply staple yarn would be: ***210 tex: Z 180 x 3 S 125: R660 tex***

2.6 CARPET BACKING

Backing is the part of the floor covering that lies under, and is intimately attached to, the pile. It is composed of one or more layers of material, which serve as a support of the pile, assisting to stabilise dimensions or acting as a cushion. There are two types of backing: primary backing and secondary backing.

2.6.1 Primary Backing

Primary backing is the pre-formed fabric that acts as a carrier for the use surface in a tufted carpet.

2.6.2 Backing Type and Construction

Primary backing for tufted carpets is available in two basic forms:

- woven primary backing material
- non-woven primary backing material

The tender may specify the type of primary backing material required.

2.6.3 Mass Per Unit Area of Primary Backing Material

Measurement of mass per unit area of primary backing materials is to AS 2001.2.13
Tolerance: ±10%

2.6.4 Maximum Extractable Matter

For jute products only, the maximum extractable matter allowed is 5% when tested to AS 2001.3.4.

2.7 SECONDARY BACKING

Secondary backing is the fabric that forms an additional stabilising layer in the substrate of a textile floor covering. It often forms the final coating or layer on the back of the floor covering.

2.7.1 Secondary Backing Type and Construction

Secondary backing material for tufted carpet is available in three common forms:

- woven secondary backing
- non-woven secondary backing
- foam secondary backing

The tender may specify the type of secondary backing material required.

2.7.2 Mass Per Unit Area of Secondary Backing Materials

Measuring the mass per unit area of secondary backing materials is to AS 2001.2.13
Tolerance: ±10%

2.8 PERFORMANCE AIDS

Product performance aids can be used to enhance certain aspects of the performance of a carpet. The performance aids should be applied in accordance with the recommendations of the supplier. The most common aids and treatments include:

- staining and/or soiling retardants
- static electricity suppressants
- ultra-violet light inhibitors
- fire retardants
- microbial treatments

The specifier should ensure that the application of any performance aid does not detrimentally affect other properties of the carpet.

2.6 FLAMMABILITY

Specifiers should refer to the Building Code of Australia which outlines the flammability requirements for particular classes of buildings. The major independent textile testing laboratories can advise on flammability testing procedures and interpretation of requirements.

Appendix A

Australian Standards

AS 1385	Textile Floor Coverings - Metric units and commercial tolerances for measurements
AS 2001.2.13	Determination of mass per unit area and mass per unit length of fabrics
AS 2001.2.14	Determination of twist in yarns
AS 2001.2.23	Determination of linear density of textile yarn from packages
AS 2001.3.4	Determination of solvent - soluble matter
AS 2001.4.8	Determination of colourfastness to water
AS 2001.4.16	Determination of colourfastness to dry cleaning solvents
AS 2001.6.1	Determination of the resistance of textiles to certain insect pests
AS 2001.7	Quantitative analysis of fibre mixtures
AS 2111.11	Determination of total pile mass per unit area by complete dissection of textile floor coverings
AS 2111.15	Determination of withdrawal force required to remove tufts or pile from a textile floor covering
AS 2111.16	Determination of bond strength between backing components of a textile floor covering
AS 2111.19.1	Colourfastness Tests - Rubbing
AS 2111.19.2	Colourfastness Tests - Shampoo solution
AS 2111.4	Method for the determination of surface pile mass above substrate
AS 2111.5	Determination of thickness of pile above substrate of textile floor coverings
AS 2111.9	Determination of the number of tufts per lOOmm in direction parallel to and at right-angles to the selvedge of textile floor coverings
AS 2119	Method for sampling and cutting specimens of textile floor coverings for testing
AS 2454	Textile Floor Coverings - Terminology
AS 2455	Textile Floor Coverings - Installation Practice
AS 2622	Textile Products - Fibre Content Labelling
AS 4288	Soft underlays for textile floor coverings

SECRETARIAT

The Carpet Institute of Australia Limited (CIAL) is a non-profit organisation sponsored by Australian carpet manufacturers, their suppliers and other companies that provide goods and services to the carpet industry.

The CIAL undertakes a range of activities covering government affairs, industrial matters, consumer relations, product marketing, research and information services, and technical development. The CIAL also administers the Australian Carpet Classification Scheme and the Carpet Industry Arbitration Service.

CIAL member companies are bound by a Code of Ethics which promotes fair dealing and ethical business practices.

THE AUSTRALIAN CARPET CLASSIFICATION SCHEME

Major carpet manufacturers also carry extensive stock lines and ranges of contract carpet. Most of these products have been assessed independently by the Australian Carpet Classification Scheme (ACCS). All ACCS carpets are independently tested and graded according to established procedures and internationally recognised tests. The minimum requirements set in Section One of this bulletin are the minimum requirements for carpets graded by the ACCS.

The ACCS uses a labelling system that identifies carpet according to recommended end-use. There are two categories of Location Guide Labels - carpets graded for **CONTRACT** use are identified by red labels; carpets graded for **RESIDENTIAL** use are identified by blue labels. Within the two broad categories there are four end-use classifications that identify the type of installation to which the carpet is best suited. The series starts at **Light** and moves through **Medium**, **Heavy** and **Extra Heavy**. Examples of ACCS Contract and Residential labels are shown below.

Further technical information on the ACCS and grading procedures is contained in **Technical Bulletin No. 4 - *'Carpet Construction and Its Mathematics'*** which is available from the Carpet Institute of Australia.

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Photographs courtesy of Tascot Templeton

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