Nolan Group

Blind & Awning Division

What Blind Freddy Knew: Awning and Outdoor Blind Fabrics

Technical Guide Number Three

ABOUT THE NOLAN GROUP

The Sydney Warehouse in the mid-sixties. Captured in the picture (bottom right) is William Marden Nolan, son of Nolan O'Rourke's founder William Bernard Nolan.

Nolan UDA Pty Ltd, now trading as the Nolan Group, was officially incorporated in 2009. It originally comprised of the merger of the trading operations of Nolan O'Rourke and Co. Pty Ltd (trading as Nolan Warehouses) and Upholstering Distributors Australia Pty Ltd, and hence the company name.

In 2016, the business of Radins Australia Pty Ltd was formally integrated into the company. Despite its hybrid nature and relatively short history, the Nolan Group has a proud legacy inherited from its constituent partners.

Nolan O'Rourke was established in 1920 by William Bernard Nolan, and is still third generation family owned. The company had its beginnings importing motor body parts and accessories, but over the years, it diversified first into upholstery and furnishing supplies; then into the industrial textiles and commercial flooring.

Upholstering Distributors Australia Pty Ltd (UDA) is also a fourth-generation family company as a part of Thomas Peacock and Sons, established in 1881. The operations of that group have included the manufacture of bedding, expanded foam and lofted polyester.

These two businesses were well suited to merger. They were of similar size, operated in a like fashion and sold comparable (some identical) products to the same market segments in overlapping geographic areas. They complimented each other well, especially in terms of relative market penetration by both product type and geographic location.

Importantly, the partnering businesses were well established, had an excellent reputation and a high level of mutual respect, mainly because of similarities in their cultures and business approach.

The success of the original merger led to the Radins acquisition. Radins had its origins in the nineteenth century as a sailmaker, and the morphing into a wholesale distributor occurred gradually, with the fabrication arm sold off in the early nineties. The company's specialty was fabric supply to the awning and blind sector, complimented by a significant presence in marine and industrial fabrics.

The merger has allowed the company to realise its ambition to become a complete wholesaler of outdoor textiles and related products to the automotive, marine, awning and blind, industrial fabrics and commercial market sectors. The business trades from six branches throughout Australia, located concentrically within the country's population and customer base.

DICKSON

As the oldest textile company in France, Dickson® can trace its origins to 1836, when it opened spinning mills in Dunkirk. A few years later, it added weaving to its spinning activities, manufacturing sail canvas, which had innovative rot proof properties. Just after the Second World War, it was one of the first companies to introduce synthetic textile fibres into its product mix. It merged with competitor Constant in 1969, and after a period of rapid expansion worldwide, it became part of the Glen Raven Group in 1998. The company manufactures awning and marine acrylic fabrics, screen fabrics for internal blinds, coated PVCs for shadesail and tensile structures, and woven PVC flooring products.

GLEN RAVEN, INC.

Glen Raven, Inc was founded in 1880 as an apparel company, but quickly morphed into an integrated textile business. By 1940, for example, it was a leader in the supply of parachute fabrics; and very quickly embraced the opportunities provided by the development of synthetic yarns. It changed the fashion industry in 1958 with the invention of pantyhose, and with the launch of Sunbrella acrylic in 1961, succeeded in supplanting the use of polycotton canvas in the US awning and marine markets. The company is headquartered in North Carolina, and also has manufacturing facilities in India and China. It employs 3,500 people worldwide.

ACHILLES CORPORATION

Established in 1947, Achilles is a Japanese listed public company with manufacturing facilities located worldwide. The company's activities are categorised into four divisions - Footwear, Plastics, Industrial Materials and Rubberised Cloth. The Nolan Group brands Rollclear and Rollglass are manufactured by the Plastics Division at the modern Ashikaga factory near Tokyo. These and similar products are widely used for agricultural greenhouses, industrial curtains and screens, roll-up blinds and boat enclosures. Specialty films incorporating flame retardants, tints and conductive prints for use as welding screens, insect repellant blinds, and anti-static curtains are also manufactured at the plant.

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"Standing on the outside, I don't know where I'm going to
But I do know just one thing, and that is it's over with you

Blind Freddy knew that, a blind man could see
I was in love with you, but you weren't in love with me"

Lyrics from the song "You weren't in love with me" by Billy Fields

INTRODUCTION

Under Australian Consumer Law (which was enacted January 2011), a blind fabricator, being 'a supplier and manufacturer of goods', must guarantee that his goods are of 'acceptable quality'. The test for 'acceptable quality' is whether a reasonable consumer would find them fit for purpose, acceptable in appearance and finish, free from defects, and durable, that is, function for a reasonable period of time after purchase.

A "consumer" can be a corporation. For example, a building body corporate, which commissions a fabricator to undertake work up to $40,000 in value, is considered a 'consumer' under the Act, and has considerable rights of remedy if the goods are found not to be of acceptable quality, including full replacement or refund.

To assist fabricators in managing this risk, the Nolan Group has developed a formal 'Fit for Purpose' Statement which is designed to clarify the meaning of the frequently used terms of the Consumer Act, in the context of products used in an outdoor environment. This refers to the basic product technical specifications published in our Fabricator Product Catalogue and Technical Guides, and is incorporated into our formal warranties.

Further, it is important that awning and blind fabricators have an in depth understanding of the materials used in their trade. This is because essential features of products used in the industry are not easily discerned. For example, fabrics may have UVR stabilisers and mildew inhibitors added, and need to be heat-set to minimise shrinkage. None of these features, however, can be determined simply by sight or feel. It is therefore important to understand the production processes, specifications and test methods that are used to assess comparative performance. Only then can an informed choice be made of the right product to use in a particular circumstance or between competing products.

Many of the products used in the fabrication of awning and outdoor blinds are used in other applications, such as marine canopies. Because of this commonality, the basic features of product composition and manufacture, together with a description of the fabric tests that underpin the technical specifications of the products, are contained in Technical Guide Number One 'How to Tell a Great Yarn - Textile Manufacture and Testing'.

The basic objective of this guide is to present further technical information that is specific to the "Outdoor Blind and Awning" sector. In particular, it provides advice on product selection and fabrication, based on industry experience gleaned from a wide range of end-use applications.

The products supplied by the Nolan Group are sourced from quality endorsed manufacturers, and their quality control procedures are fully documented and externally audited. This is designed to ensure that the products when manufactured do meet the published specifications. Further, the Nolan Group's limited warranties are supported by those offered in turn by our respective manufacturers, which should give confidence that the products supplied will indeed meet our Fit for Purpose Statement.

The Nolan Group 'Fit for Purpose' Statement

The Nolan Group's products are specifically designed to be used for the recommended purpose and are guaranteed to be supplied free of defects.

'Free of defects' means that the product meets its published description and technical specification and is homogeneous in appearance after allowance for minor variance, for example weaving floors, that are inherently the result of the manufacturing process.

The Nolan Group further warrants that the product will perform satisfactorily when used in its design context in the temperate climatic conditions experienced throughout Australia.

'Satisfactorily' means with continued but gradually diminished utility over its expected life, due to the unavoidable effects of Ultra-Violet Radiation (UVR) and weathering, such as colour variation, strength loss, and dimensional change. Extreme climatic conditions, particularly high temperature and humidity may accelerate the inevitable product degradation.

'Expected life' is at least the period covered by warranty, provided the product is installed properly, and cleaned and maintained as recommended.

Disclaimer

This guide is one of a series of similar publications prepared for all products sold by the company. The information is based on that provided by product manufacturers, fabricators, industry associations or our general experience, and is given in good faith, but because of the many particular factors which are outside our knowledge and control, and affect the use of products, no warranty is given or is to be implied on its accuracy.

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Typical Awning Configurations

Folding Arm Awnings

Folding arm awnings (Figure One) are probably the most common type of commercial awnings used in Australia. Its popularity is a direct function of its versatility. Figure Two shows the dimensions and terminology used to describe the awning. The maximum awning span is theoretically determined by the maximum possible extension of the arms, which is a function of their structural stability under wind loading; but is constrained practicably by the necessary allowance for pitch. The width can theoretically be continuous; but is constrained practicably by the deflection of the roller tube caused by the weight of the rolled fabric.

The awning may be motorized, often with automated controls which open or retract based on weather conditions, or operated manually with a crank. The retracted, rolled up awning may be fully exposed, or protected by a varying degree, dependent on the type of cover box chosen (refer Figure Three). The coverbox keeps the otherwise exposed fabric clean and provides additional water protection to the motor.

Figure One – A Typical Folding Arm Awning Shading an Apartment Balcony

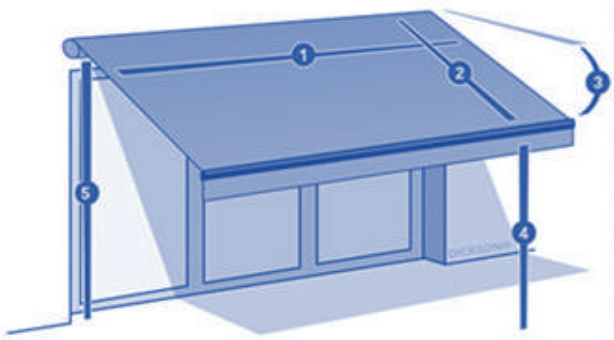


Figure Two (a) - Folding Arm Awning Dimensions:

1. Awning Width
2. Awning Span
3. Awning Pitch
4. Valence Height
5. Mounting Height

Figure Two (b) – Folding Arm Awning Terminology:

1. Valence
2. Front Bar
3. Folding Arms
4. Roller Tube

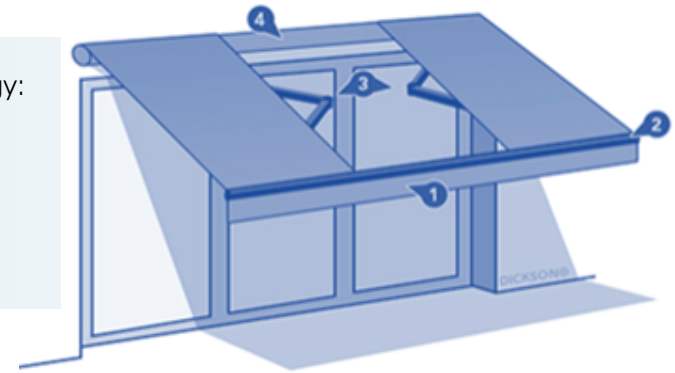
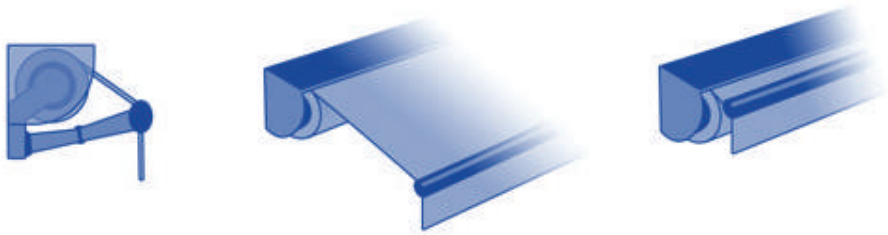
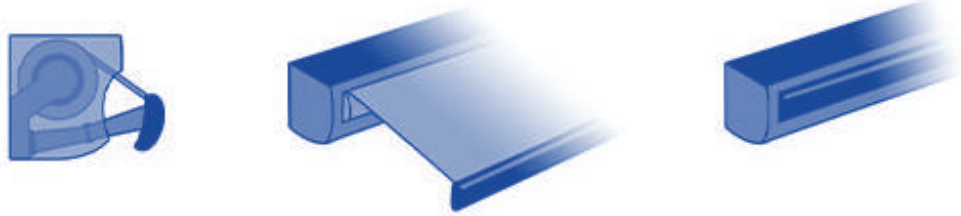


Figure Three – Types of Folding Arm Awning Covers

Unprotected awning

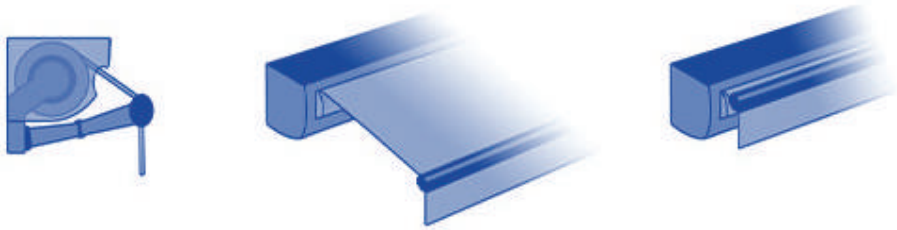
Awning with coverboard





Box awning

Cassette or semi-box awning



Drop Arm or Pivot Arm Awning

A drop-arm awning (Refer Figure Four) is essentially a vertical roll-up blind with lever arms attached to each end of the base bar. Typically, the other end of the arms are pivoted adjacent to the opening at a point midway in the drop which allows the awning to be vertical in the fully open position. The actual positioning of the bottom bar, with various configurations illustrated in Figure Five, is determined by the extent to which the awning is unrolled.

The awning operation can be motorised, or controlled by a crank; and protected in the closed position by a cover box. It can also be designed so that the base-bar projects at an angle in the fully closed position, which allows windows to remain open when the awning is fully extended.

Figure Four – Underside View of a Drop Arm Awning

Figure Five – Typical Positioning of a Drop-Arm Awning, Determined by the Extent by Which the Fabric is Unrolled

Dutch Canopies

There are many variants of the drop-arm concept, including the Dutch Canopy (Figure Six). It has multiple arms, which connected to battens, dictate the finished half-barrel shape (refer Figure Seven). The canopy can be fixed, or retractable, rotating around the fixing pivot points, and operated using a crank or pull cord, if it is not motorised.

Figure Six – A Dutch Canopy Awning

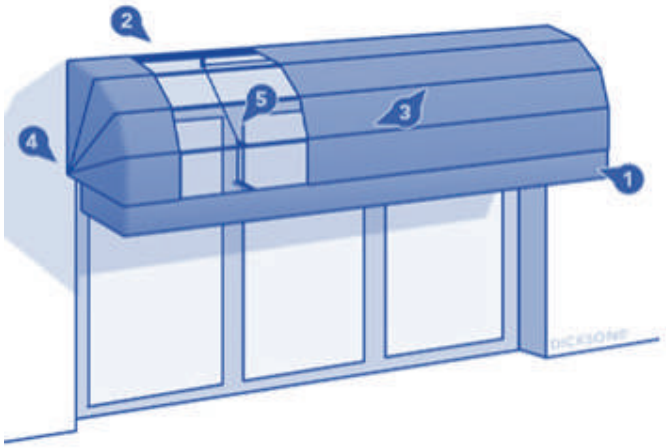
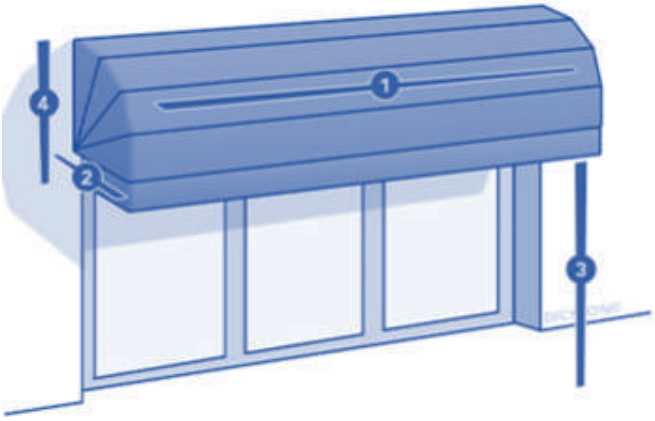


Figure Seven (a) – Dutch Canopy Terminology:

1. Valance
2. Fixing beam
3. Battens
4. Fixing pivot point
5. Pull Cord

Figure Seven (b) – Dutch Canopy Dimensions:

1. Width
2. Extension
3. Clearance
4. Drop



Fixed Guide Awning

Another variant of the drop-arm concept is the fixed guide awning (refer Figure Eight), which operates on a track attached to the borders of the window. It can be manually operated using a spring or gear, but is particularly suited to motorisation.

Figure Eight– A Typical Fixed Guide Awning with Guide Mechanism Highlighted (Photo: Courtesy of C.E. Bartlett Pty Ltd)

Another contemporary method commonly applied is the 'Wire Guide Awning' where a tensioned Stainless Steel 316 cable is substituted for the track.

These configurations are designed to completely screen the opening in a near vertical position, with track or cable providing excellent stability in windy conditions.

The are popular in the southern parts of the country, where summer daylight hours are prolonged and can be very hot. They are ideal for western facing aspects, especially when a blockout fabric like Brella polycotton canvas is used.

Automatic Lock Arm Awnings

Essentially a variant of the fixed guide concept, these are spring operated and incorporate a fixed arm that connects to the bottom bar, thus projecting the awning at an angle when it is in the open position. The track is configured at the top end to allow the arm to fold to the vertical position, when the awning is retracted (Figure Nine). This variant is particularly popular, and also known simply as a 'Sun Blind', or 'Spring operated Locking Blind', or just 'Lock Arm Awning'.

Figure Nine – An Automated Lock Arm Awning, Showing the Detail of the Lever Arm. (Photo: Courtesy of C.E. Bartlett Pty Ltd)

Fixed Awnings

As the name implies, fixed awnings are affixed in a permanently open position, which has the obvious disadvantages of lack of flexibility and continual exposure to weathering. The advantage is that they are less expensive than retractable options. The fabric is generally attached to an aluminium or steel frame, in many cases simply to be decorative adornment to a building façade, and in commercial instances, often with printed signage.

Figure Ten – A Typical Fixed Awning

Guide to Awning Selection

If the main objective is to provide outdoor patio protection in mild climatic conditions, then a folding arm is an ideal solution, and will provide adequate and adjustable shelter from the sun, light winds and light rain. It can be fabricated up to a width of up to twelve metres, and a span of up to five and a half metres. However, it must be remembered that the front bar is cantilevered, and therefore the folding arms are vulnerable to significant and possible damaging deflection in high wind, or heavy rain or hail. The owner must be made fully aware of this risk, and be able to quickly retract the awning if necessary. Motorisation greatly facilitates this task, and coupled with automatic sensors, removes the risk of inadvertently leaving an unattended awning in the extended position.

A rule of thumb is that the awning should be retracted if wind speeds exceed fifty five kilometres per hour (or thirty knots). Rain can also be damaging, and a minimum pitch of twenty five centimetres for each metre of projection (i.e. 14°) is recommended to ensure shedding of water in that event.

The pivot arms of retractable drop-arm awnings and canopies enhance the resistance to wind load, and are ideal for protecting windows and doors. The disadvantage compared to folding arm awnings is that their span is limited.

Given that most of the population of Australia lives near the coast, the site location may be subject to particular climatic circumstances that influence the choice of awning and componentry; such as strong prevailing breezes, and above all the corrosive action of wind borne salt spray. Aspect is also important, as a western facing folding arm awning in the horizontal position, for example, has little shading effectiveness in the late afternoon.

Regardless of the choice of awning type, the componentry should be either aluminium or stainless steel, and carry a warranty from a reputable manufacturer or supplier. Motors should have a manual override capacity.

The most crucial engineering detail for all retractable awnings is anchoring. All anchor bolts should be a minimum of ten millimetre diameter stainless steel, and imbedded at least seventy five millimetres into a suitable substrate, such as a wood or metal beam. The number of anchors and folding arms required are dependent on the awning size, and the component manufacturers advice should be sought to in this respect.

Awnings are not generally subject to regulation, but there are some exceptions. For example, the municipality of City of Sydney has some requirements for awnings, particularly for heritage listed buildings, and for some commercial applications, particularly on premises with street frontages.

In mid 2018, the Australian Building Codes Board also changed the fire regulations in the National Construction Code relating to Class Two through Class Nine buildings, which essentially covers all residential high rise, and buildings used for commercial, educational, healthcare and hospitality. These changes effectively restrict the use of conventional awning and blind materials to ground floor applications (refer Technical Guide Number One for more details). The Nolan Group is working with the Blind Manufacturers Association of Australia to develop a process of providing a 'performance solution' to meet the National Construction Code requirements in this respect.

Finally, avoid installing an awning over a heat source, such as a barbeque or an outdoor space heater. Typical awning fabrics simply do not have sufficient resistance to the heat that can be generated through convection by these appliances.

Typical Awning Fabrics

There are many brands of awning fabrics available on the market, of varied composition, weather-proofing, weights and widths. But all of them can be classified into five basic groups, as illustrated in Figure Eleven: Physical Structure of Outdoor Fabrics. The outdoor fabrics supplied by The Nolan Group, including those used in awnings, are grouped into these categories in the company's Fabricator Catalogue.

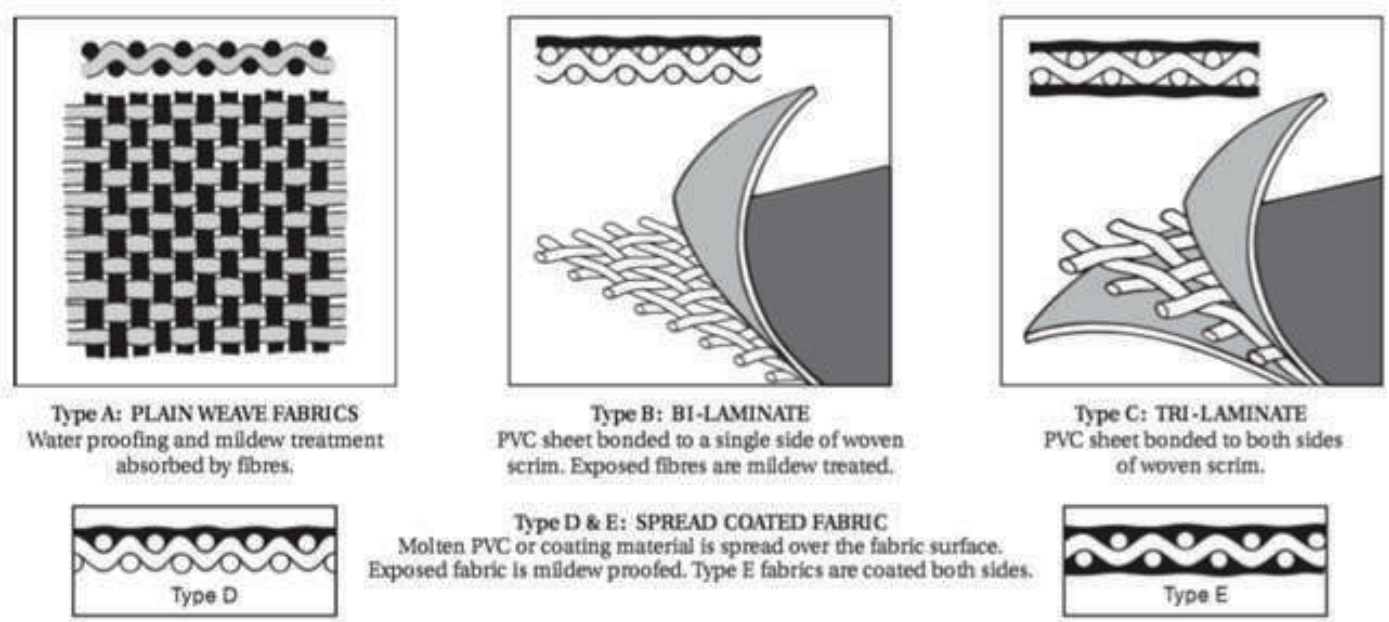


Figure Eleven – Physical Structure of Outdoor Fabrics

By far the most commonly used awning fabrics in Australia fall into the "Type A Plain Weave Fabrics" classification; namely canvas woven from either acrylic fibre, or a polyester cotton blend.

The acrylic canvas sold by the Nolan Group is manufactured by Glen Raven, and marketed under the Dickson and Sunbrella brands. The polycotton canvas sold is manufactured by either Hunter Douglas or Bradmill, and marketed under those company names. A description of the products' composition, and features and applications are listed in Table One.

Guide to Selection and Use of Awning Canvas

Acrylic Canvas

Dickson provides detailed guidelines for cutting, sewing and welding Orchestra fabrics, which can be downloaded from our website www.nolans.com.au. The following is Glen Raven's general advice edited based on Australian experience. Care instructions are reproduced in Appendix C.

Application

Because of its relatively light weight, acrylic canvas is used in folding arm awnings almost universally, and in many drop-arm applications. To minimise indentation and wrinkling, it should be aligned with the warp in the direction of the extension or the drop, with the exception of Dickson® Infinity, which is specifically designed to be 'railroaded', and can be aligned in either the warp or weft direction.

Acrylic fabric does tend to expand, rather than shrink in service, which is why narrower widths are preferred by fabricators, as the vertical seams act to reinforce and stabilise the finished awning. Glen Raven also recommend that the pattern should be undercut by half a percent in each direction.

However, note that in operation, if the fabric is aligned as recommended, a tension load is being applied in the warp direction, which will induce positive strain (i.e. extension) in that direction, offset by a negative strain (i.e. contraction) in the weft. Hence, logically, a relatively greater relative undercut should be made in the warp direction, the extent of which is determined by individual fabricator preference or experience.

Cutting

Sunbrella® and Orchestra should be cut with a hot-knife or ultrasonic cutting instrument or similar, in order to fuse the cut edge, and prevent fraying. Always provide proper ventilation when cutting with a hot blade instrument.

The polyurethane backing of Sunbrella® Plus and Orchestra Max give enough stability to these fabrics to eliminate the need for using a hot knife to seal the edges of the fabric. All that is needed is a sharp pair of shears. If Sunbrella or Orchestra are cut with scissors, the edge will need to be overlocked. Do not tear the fabric.

Sewing

Sewing is the most common and practical method of fabrication, but welding with thermo-reactive adhesive tapes is also practicable. Hot melt gluing is possible, but rarely used in practice.

When sewing panels together, a double needle machine equipped with a puller is ideal. The overlap is recommended to be 20 mm. A lock stitch machine with a walking foot is suited for hemming, which is necessary only if the fabric is cut with shears.

For seaming, hemming and general sewing applications, the thread should be Polytetrafluoroethylene (PTFE), of minimum size 150 Tex (Solarfix is the brand sold by the Nolan Group). The heavier the thread, the better; and provided it is compatible with the sewing machine, a heavier 264 Tex is recommended.

Alternatively, a UVR stabilized polyester thread of 135 Tex can be used, but bear in mind this thread will lose strength over time. Quality Thread and Notions' B138 is recommended because the thread colours exactly match the base Sunbrella fabric. Avoid the use of polycotton, because of the risk of seam mildew. Use the same size thread for the bobbin as for the top stitch, and maintain light to medium tension on both, with a spacing of 5 to 6.5 stitches per inch for awning applications.

Use the smallest size needle with which the machine will stitch properly. Inspect and if necessary, change needles for best results. Thread breakage is often related to a burr in the needle and not necessarily the size of the needle itself.

Refer to the machine manufacturers' guide for the recommended needle size, but our experience suggests that Nm 100 to 125, (or #16 to 20 Singer size) is appropriate for Solarfix 150 Tex; and Nm 140 to 200 (#22 to 25) for QTN B138 thread. Fabricators commonly use an R (regular round point), RG (round point rounded tip) or FFG (light ball point) needle. If when using an R point you notice that you are puncturing/cutting some of the warp or fill yarns in the fabric you may consider changing to an RG, FFG or other ball point needle. The ball point will tend to 'push' between yarns instead of cutting them.

Maintain tension in front of and behind the needle during the sewing process to minimise puckering or gathering of the fabric when seaming. Avoid too much back stitching because this technique can weaken the fabric and cause the fabric to tear more easily.

If seams are properly stitched with the correct needle size, leakage is unlikely. However, even with best practice, leakage sometimes occurs. In this event, spray the seams with 303 Fabric Guard. Most fabricators use an overlap seam, which varies from 12 mm (1/2") to 20mm (3/4"); which is either double needled or double stitched. The use of acrylic braid and centerfold binding is recommended for valences and stapled connections respectively.

Heat Sealing

Sunbrella® and Orchestra can be heat-sealed using adhesive tape by radio frequency, wedge, impulse and hot air welding machines. When RF welding, attach a layer of teflon to the bar to prevent fabric scorching. It may be necessary to experiment with temperature, speed and dwell time settings. Consult the heat-sealing equipment manufacturer to determine optimum procedures and the proper heat-sealing tapes to be used with a particular machine. Dickson provide more specific advice in this respect.

Test bond strength when changing rolls of fabrics and tapes. Adhesion after 24 hours should be 18 Newtons (4 lbf) or higher. This should produce a side-to-side bond that is stronger than the fabric itself.

Installation and Fabrication Tips

Make sure the fabric does not flap or rub against walls, posts, concrete, shrubbery etc. and that there are no sharp edges or rough spots on the framework to minimise the risk of wear and leakage. Reinforcement should be used where the fabric contacts the framework, especially over squared/sharp angles to reduce abrasion and possible tears.

Battens should be no more than 900 mm apart, and the fabric affixed by lacing or similar, in order to reduce the wind whip of fabric against the frame which can lead to possible damage and leakage. Use large enough tubing and bracing in the framework to insure a stable installation.

A minimal pitch of between 1:4 (i.e. 14º) and 1:3 (i.e. 18º) is recommended for proper drainage and best overall performance of the fabric. For applications with less than optimum pitch, increase the number of battens, install drain eyelets (weepers) behind the front bar and use a double front bar to ensure maximum tension. Alternatively, use Sunbrella® Plus or Orchestra Max, which have a higher degree of water repellency.

When recovering an existing frame, inspect it first for rust, corrosion or rough surfaces. If any are found, they should be sanded, primed and painted; or if severe, the framing replaced. If these defects are not remedied, they can lead to stains and abrasion damage to the new fabric in a short period of time.

The fabric should be handled with care during all stages of manufacture, transport and installation otherwise unsightly marking will occur caused by disturbance of the surface finish, which can be particularly noticeable in darker colours. Note that imperfections such as excessive 'mottling, waffling and folds' caused by lack of such care are not covered by the fabric warranty.

Installation tolerances for folding arm awnings need to be very tight. The awnings must be set absolutely level, in order to ensure that no offset occurs in rolling-up, or else wrinkling and marking of the fabric will occur. Sufficient clearance must be allowed for the fabric to roll-up unimpeded, in order to avoid damaging abrasion. Note that the wider the awning, the greater the deflection in the centre of the roller tube, which again can induce wrinkling. The selection of an appropriate size tube with sufficient bending resistance is an important consideration in design.

The cleaning and care instructions emphasise regular maintenance, and avoidance of the use of harsh chemicals. Even so, the fabric is durable and can be treated with mild concentrations of bleach, which is useful for treating stains like bird-droppings. The main thing to avoid is harsh rubbing, as this tends to abrade the fabric and remove the surface waterproofing, but even this can be rejuvenated if necessary.

Despite the instruction to the contrary, the consumer sometimes retracts the awning when it is wet, which will sometimes lead to a mildew problem, which is in any case always going to be a problem in tropical climates, or at times of the year when the temperature and atmospheric humidity are high. Again in these circumstances, treatment with a diluted solution of bleach is usually effective. However, although the fabric is resistant, the thread used may not be, so bleach should always be used with caution!

Polycotton Canvas

Polycotton canvas is heavier and more opaque than acrylic, and has traditionally been the standard product used in 'fixed guide awnings'. The product specification for Bradmill's Brella, which is similar to that of the Hunter Douglas canvas, nominates a shrinkage value of -4% (contraction) in the warp direction, and +0.2% (expansion) in the weft. For this reason, Bradmill recommend the following installation practice (which should also apply to the Hunter Douglas product):

"To minimise the effect of warp (lengthwise) shrinkage on awnings, Brella® awning canvas should always be mounted in the warp direction between top fixtures or rollers and the bottom rails of awning units where no provision for horizontal or sideways tensioning is made."

"New awnings should always be drawn down fully and left down for a period of 2 to 4 days. This process will allow the canvas to condition (i.e. fabric will relax and construction will tighten). This will serve to eliminate any waviness or wrinkles in the fabric. Also, during the life of the awning, under both summer and winter conditions, it is advised that the awning be periodically drawn to the full down position to allow ongoing conditioning. This is especially important if the awning has been rolled up either fully or partially for long periods of time."

Given the composition of the base fabric, it is appropriate to use a polycotton thread for joining and seaming, provided the fabricator and consumer are aware of its limitations. Coats Terko 12 (210 Tex) is the minimum size recommended, the relevant needle sizing being Nm 130 to 160 (#21 to 23 Singer size).

The care instructions for polycotton canvas (copy attached in Appendix C) are similar to those for acrylic. The same caveats apply, with regard to the risk of loss of proofing and of abrasion with excessive rubbing; and also the use of bleach. The same warning regarding retraction of the awning when wet also is repeated.

Table One Awning Canvas Fabrics Sold by the Nolan Group

Brand	Nominal Finished Weight	Type (Figure Eleven)	Nominal Width	Description	Features and Recommended Applications
Bradmill Brella	500 gsm	A	220 cm	Poly/cotton (52/48) canvas. Warden proofed for mildew, rot and water penetration resistance. Painted surface finish.	Particularly suited for traditional drop down or fixed guide awnings.
Hunter Douglas	498 gsm	A	220 cm & 280cm in some colours.		
Dickson® Orchestra Orchestra MAX	290 gsm to 320 gsm	A D	120 cm	100% woven solution dyed acrylic with fluoro carbon water repellent finish. Orchestra Max has a polyurethane waterproof coating on the underside.	Available in a broad selection of colours and stripes, and also in a Jacquard weave. As with other acrylics, particularly suited for fold out awnings.
Dickson® Infinity	290 gsm	A	320 cm	100% woven solution dyed acrylic with fluoro carbon water repellent finish.	Can be successfully fabricated with the weft in the direction of the awning extension. Especially designed for large fold out awnings.
Dickson® Spark FR	290 gsm	A	120 cm	100% woven polyester with fluoro - carbon water repellent finish. Commonly used in awning applications.	Designed to meet likely changes to the flammability standards in the Australian National Construction Code.
Glen Raven Sunbrella®	310 gsm	A	200 cm in popular solid colours; 152 cm available in boutique colour selections, and stripes	100% woven solution dyed acrylic with fluoro carbon water repellent finish. Commonly used in marine applications.	Particularly suited where "breathability" is essential. Requires periodic re-proofing to retain water penetration resistance
Glen Raven Sunbrella® Plus	340 gsm	D		100% woven solution dyed acrylic with fluoro - carbon water repellent finish on top surface, and a polyurethane waterproof coating on the underside (Type D fabric). Widths and colour selection as for "Sunbrella" above.	Surface finish identical to 'Sunbrella' but has higher degree and longevity of water penetration resistance. Does not 'breathe' to the same extent.
Herculite Natura	610 gsm	C	152 cm	PVC laminated polyester scrim, with acrylic lacquer. Stain and mildew resistant. Surface emboss has a woven fabric look and texture. RF weldable.	Designed to meet likely changes to the flammability standards in the Australian National Construction Code.

Typical Blind Configurations

The simplest configuration is a "straight drop" blind, which is rolled up and down. Historically, these have been controlled by a cord and pully system (Figure Twelve), which has been largely superseded by crank operation (Figure Thirteen), primarily for safety reasons. In both instances, the base of the blind is usually anchored by detachable hooks or snap-hooks.

Figure Twelve – Drop-down blind operated using a cord and pully system, which has been largely superseded by crank or guided systems.

Figure Thirteen – An example of a crank operated straight drop blind, manufactured from clear PVC. The crank hook is circled (Photo courtesy of C.E. Bartlett)

In recent years, track guided blinds (Figure Fourteen) have become very popular with consumers, particularly the leading Ziptrak® brand. The system has the advantage of fully enclosing the blind opening, which provides obvious benefits in terms of insect protection and climate control. With the spring loaded roller, the bottom bar can be easily be set at any desired height. Alternatively, the system can be fully motorised, which in turn can be powered by a solar panel. With PVC coated mesh, Ziptrak® can readily be fabricated to a width of up to 6 metres, and a drop of up to 3.5 metres. The key features are the dual tracks (Figure Fifteen), which allow ready accommodation of non-square openings, and the lubricated tape which facilitates the free and easy movement of the blind.

Figure Fourteen– Typical track supported outdoor blind (photo courtesy of Ziptrak®). The spring loaded or motorised rollers allow the blind to be set at any desired height.

Motorisation has also revolutionised the standard 'Drop-down' blind, with the introduction of vertical, tensioned guide wires, on which the bottom bar slides. As with track guided systems, the blind can be stopped at any point in its drop, with the wires providing resistance to wind loading.

Figure Fifteen– The Ziptrak® dual track and tape system

Types of Outdoor Blind Fabrics

Awning fabrics are also used in blinds, but not to the same extent as PVC coated polyester mesh, and flexible clear PVC. The Nolan Group's PVC Coated polyester mesh is marketed under the brandname 'Vistaweave'. A description of the product's composition and features and applications are listed in Table Two.

In its rigid form, PVC or polyvinyl chloride, comprises a linked chain of carbon and hydrogen atoms similar to polyethylene, except that every fourth hydrogen atom is supplanted by a chlorine one. The result is a stable, durable and chemically resistant material, and with UV inhibitors added, one that is widely used in outdoor applications. The addition of 'plasticisers' in a proportion of about 30% by weight provides flexibility, but also significantly changes the material's characteristics, particularly its flammability.

PVC Coated Polyester Mesh

PVC coated polyester mesh is widely used in different applications. Available in different weights and strengths, it's used for upholstery, banners, truck tarps, awnings and blinds. The polyester core yarn provides the strength and stability to the finished product. Each PVC yarn within the matrix is individually extruded and bonded to the polyester core yarn. The PVC coating completely seals the polyester fibre, making it durable and waterproof; and also provides a physical bond between the warp and weft yarns, which introduces remarkable dimensional stability to the entwinned mesh.

Table Two Type E' PVC Coated Polyester Outdoor Blind Mesh Fabrics

Brand	Nominal Weight	Nominal Width	Description	Recommended Applications
Vistaweave 95	530 gsm	270 cm & 320 cm	A dual yarn weave, with a 37 x 35 pick count and 5% Openness Factor. UV stabilised with flame retardants and fungicides added to the PVC formulation.	Designed for awnings and blinds, and general outdoor applications, including seating.
Vistaweave 99	710 gsm	300 cm	Similar construction to Vistaweave 95, but with a 36 x 24 pick count and 1% openness factor.	
Vistaweave Stripe	500 gsm	270 cm	Similar construction to Vistaweave 95, but with a 36 x 16 pick count.	

The strength of the mesh is determined by the 'denier' (i.e. size) of the polyester yarn, its 'tenacity' (i.e. tensile strength) and the 'pick count' (i.e. how many yarns per inch). The heavier the denier and the higher the pick count, the stronger the final fabric and greater its dimensional stability.

The PVC coated polyester mesh used for blinds has a high level of UV inhibitors, flame retardants, and fungicides added to the PVC formulation. The warp and weft yarns are of similar denier, and the pick count is practically identical in each direction. This means that the appearance and physical properties (i.e. tear and tensile strength) are also similar in each direction. The advantage of this is that the mesh can be 'rail-roaded', that is, aligned with the weft perpendicular to the drop.

It is perhaps for this reason that the market preference is for the more open Vistaweave 95. The range has 35 colours

from which to choose, and many have been carefully selected to match or complement the Colorbond® door and window frame profiles. The sampling is put together in such a way that mix and match choices can easily be made.

In both ranges, the weave is not noticeably different in each direction (i.e. along or across the roll direction), which means the fabric can be run either way across the opening. Because of the wide width of the fabric, a single piece can be used in nearly all circumstances, and the fabricated blind therefore has no joins. When the fabric is used in conjunction with the popular Ziptrak® guidance system, the opening is fully sealed, providing an enclosure that is protected from the wind and insects.

PVC coated polyester mesh is relatively easy to fabricate, as it has good lay-flat characteristics, is dimensionally stable and can be welded without resorting to tape. Once again, cutting using a hot knife or ultrasonically is recommended to seal the edges. The fabric can be aligned in either the warp or weft direction, but joining the warp to the weft is not recommended.

Care and cleaning is pretty straightforward (refer instructions reproduced in Appendix C3. Diluted bleach can be used to remove stains and mildew, but caveats regarding the use of solvents apply. If in doubt, consult the Chemical Resistance guide (Appendix C5).

Flexible Clear PVC

Flexible clear PVC is widely used as a glazing material in awnings, tent enclosures, marine canopies and motor vehicle soft-tops. There are essentially three types of flexible PVC available on the market, 'calendered', 'extruded' and 'pressed polished', each type named after its form of manufacture. However, because of cost, only the first two types are commonly used in blinds.

Calendering is the process whereby PVC resin is heated to a semi-liquid form, and passed over a series of metal rollers to form a thin sheet of material. The initial calendered thickness is usually no more than 0.1mm, and greater thicknesses (0.75 mmm or 1.0 mm are typically used in awning applications) are the result of further lamination. In extrusion, the liquid is pushed or pulled through a die. For clear PVC, the difference is apparent in the surface finish, extrusion resulting in a smoother surface, and therefore better visual clarity. Again because of cost, the most common form of PVC sheet used in blinds is calendered. Like PVC coated polyester, the PVC mix has UV stabilisers, flame retardants and fungicides added, as well as tint pigments, which can be of different degree of intensity.

Guide to the Selection, Fabrication and Care of Clear PVC

The Nolan Group's calendered clear PVC is marketed under the brand 'Rollclear', and extruded clear under 'Rollglass' respectively. A description of the product's construction and features and applications are listed in Table Three.

Product Selection

The first decision to be made is whether to use calendered or extruded product. The difference in clarity between calendered Rollclear and extruded Rollglass is very difficult to discern when viewed through a small piece, but obvious on the finished job. Light passing through a clear PVC material is refracted at each surface. Small imperfections in the surface cause the otherwise parallel rays to be refracted at different angles, as shown schematically in Figure Sixteen, which distorts the image seen through the material. The smoother the surface, the less the visual distortion, and hence the view through Rollglass is perceptibly better than "Rollclear". The degree of distortion is subjective when assessed by the human eye, but can be measured comparatively by sophisticated electronic apparatus built specifically for the purpose.

Some thought should also be given to the selection of the thickness of sheet. The 0.75 mm is lighter and will roll up more easily than the 1.00 mm, but does not drape as well. Experience has shown that the heavier material is more suited for roll-up blind enclosures, particularly when subject to wind-load.

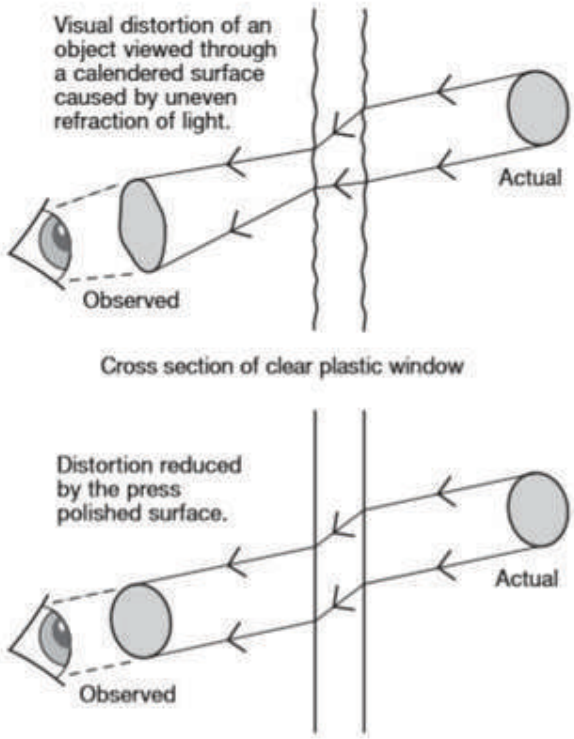


Figure Sixteen - Visual Distortion Caused by Calendared Surface Imperfections

Unreinforced clear PVC has a high ultimate strength but exhibits a high level of deformation under load. Its tear strength is also relatively modest. Caution should therefore be exercised if the material is expected to be placed under stress, as it runs the risk of becoming 'baggy' or 'ripply'. This is a particular risk in motorized, wire guided blinds, where a possible high tension load caused by the motor's torque and the counteracting weight of a heavy bottom bar can cause uneven extension across the blind, which results in corrugations along the edges of the PVC film.

Dimensional Change

Due consideration must be made of the possibility of dimensional changes in Rollclear and Rollglass, due to residual stresses resulting from the production process. Achilles recommend that before fabrication of these products, any cuts are allowed to lay flat or hang freely at room temperature for a number of days, which provides sufficient time for most of the residual stresses to be dissipated. Of course, this may be impractical in a busy workshop, but unless properly relieved, these stresses can cause shrinkage along the length of the roll of up to -3.2%, and expansion across it of up to +2.0%.

Because of the propensity for this dimensional change, it has been common practice to always fabricate clear PVC blinds with the drop in the machine (or warp) direction; the reason being that the weight of the material and bottom bar counteracts shrinkage. Even if this occurs, expansion occurs in the opposite direction, which eliminates the risk of edge stress on the supporting track or zippers.

These precautions are not necessary if the 'Dimensionally Stable' (DS) product is selected, which has been manufactured in a manner where all of the manufacturing processes that causes residual stress have been eliminated or carefully controlled. As a result, shrinkage along the length of the roll has been reduced to a maximum -1.2%, and expansion across it to a maximum of +0.6%.

Because of the different dimensional change in warp and weft directions, care should be taken in welding or joining sheets cut from a roll to ensure they are aligned compatibly, else puckering may occur. Similarly, zippers should only be used along the roll to minimise the potential strain on the chain teeth.

Storage and Handling

The packaging of all product is designed carefully to protect the contents. Rollclear is rolled around a core, which is suspended at each end. Rollglass is similarly packaged in a drum. A metre allowance is provided in each roll to

compensate for the indentation caused at the start and finish of the roll by the cut end. When removed from its packaging a roll should ideally be suspended on the core to prevent further indentation.

Plasticiser Migration or Loss

PVC is made flexible by the use of plasticisers, of which there are a variety, all different in molecular composition. When two PVC's with different types of plasticiser are brought into contact, they tend to 'migrate' from one to the other. The movement can be compared to water flowing between two connected tanks, with initially different surface levels, which continues until parity occurs. The 'migration' of plasticisers is slow, and can take several months for it to become evident, either through changes in stiffness or dimension.

Caution should therefore be exercised when using a coloured PVC laminate for edging, as these may use different plasticisers to the clear. The Nolan Group's coated and laminated products have been tested, and found to be compatible with all Nolan Group clear PVC.

Yellowing, stiffening or cracking is inevitably the result of plasticiser loss, and is irreversible. The process is normal, and gradual deterioration of all clear product will occur over the life of the product, which should be at least five years, particularly if the surface is cleaned regularly.

More rapid deterioration is a sure indication of plasticiser migration, UV degradation or chemical attack. The cause can usually be determined by laboratory analysis, and in the event of a complaint, samples should be submitted for testing.

Batch Variations

All clear PVC has a faint bluish tint, which is an integral part of its make-up, but can vary slightly between batches. Sheets proposed to be joined or adjoining, should therefore be carefully examined for such variation, which can sometimes be obvious on a finished job. When in doubt, use sheets from the same batch. When calendering or extruding PVC, it is extremely difficult to obtain uniform gauge or thickness across the roll. Although the manufacturer (Achilles Corporation of Japan) works to exacting tolerances, minute variations in thickness can occur, particularly at the edge, which can result in slightly wavy edges.

Effect of Temperature

The flexibility and dimensional stability of clear PVC varies with temperature, and it is important to do all marking and cutting out at room temperature, that is about 23^{0} Celcius, in order to minimise potential problems of expansion or contraction due to changes in temperature. Sheets installed tightly in cold weather will not necessarily remain so in warmer conditions.

Cloudiness

PVC can absorb water, which shows up as a cloudy residue. This will disappear under the action of sunlight but may take some time to do so. The problem commonly occurs when a blind is rolled wet, which traps surface moisture.

Zippers

The finished job looks best when the product is held under slight tension, but care should be taken when zippers are employed as a fastening system. Over-tensioning can damage the teeth of the zipper, or make them very difficult to close.

Table Three Achilles Brand Flexible Clear PVC Commonly Used in Outdoor Blinds that is Sold by the Nolan Group

Brand	Manufacturing Process	Thickness or Gauge	Sheet Weight	Roll Dimensions Width x Length	Roll Dimensions Packaged Weight	Tint Colour	Features and Applications
Rollclear (Standard)	Calendered (with SLS formulation)	0.5 mm (.020″)	635 gsm	137 cm x 40 m	36 kg		The SLS additive prevents sticking, enabling problem free rolling. Suited for blinds where visual clarity is not the prime motive for selection. The FR formulation has Spread of Flame and Smoke Developed Indeces of 7 and 8 respectively (AS 1530 pt III).
		0.75 mm (.030″)	950 gsm	137 cm x 30 m	40 kg		
				183 cm x 25 m	45 kg		
		0.75 mm (.030″) FR	950 gsm	137 cm x 30 m	40 kg		
		0.75 mm (.030″)	950 gsm	137 cm x 30 m	10 kg	Smoke	
		0.75 mm (.030″)	950 gsm	137 cm x 30 m	40 kg	Bronze	
		1.0 mm (.040″)	1270 gsm	137c m x 25 m	45 kg		
		1.0 mm (.040″)	1270 gsm	137 cm x 25 m	45 kg	Smoke	
	Calendered (without SLS formulation)	2.0 mm (.080″)	2540 gsm	137 cm x 15 m	53 kg		
		3.0 mm (.120″)	3810 gsm	137 cm x 10 m	53 kg		
Rollclear Dimensionally Stable	Calendered (with SLS formulation)	0.75 mm (.030″)	950 gsm	137 cm x 30 m	40 kg		
		0.75 mm (.030″)	950 gsm	137 cm x 30 m	40 kg	Smoke	
		1.0 mm (.040″)	1270 gsm	137 cm x 25 m	45 kg		
		1.0 mm (.040″)	1270 gsm	137 cm x 25 m	45 kg	Smoke	
Rollglass	Extruded	0.75 mm (.030″)	950 gsm	137 cm x 30 m	40 kg		Excellent visual clarity, suited for high profile applications, where the aspect and outlook are important.
		0.75 mm (.030″)	950 gsm	137 cm x 20 m	26 kg	Black	
		1.0 mm (.040″)	1270 gsm	137 cm x 14 m	24 kg		
				137 cm x 20 m	35 kg		
				183 cm x 14 m	32 kg		
		1.0 mm (.040″)	1270 gsm	137 cm x 14 m	24 kg	Smoke	
Rollglass Plus	Extruded with high levels of UV inhibitor added	0.75 mm (.030″)	950 gsm	137 cm x 20 m	26 kg		The 'plus' formulation has extended warranty.
		1.0 mm (.040″)	1270 gsm	137 cm x 14 m	24 kg		
				183 cm x 14 m	32 kg		

Note: Rollclear is packaged in a box of dimensions 22 cm x 22 cm x roll length; and Rollglass in a tube of 18 cm diameter.

The Nolan Group's fabric, mesh and clear PVC products are produced in roll form. Freight companies charge both by weight and cubic volume, and for convenience the relevant dimensions and roll weights are tabulated in Table Three (Clear PVC) and Table Four (Fabrics and Mesh). These values can be used to calculate total pallet loads and checked against the safe working load of forklifts or the pallet racking in which they are stored.

The products are wrapped around a cardboard core and packaged in a box or tube. All rolls are labelled on at least one end at the factory and show at a minimum; details of the range, colour, width, and roll length, as well as the factory batch and roll numbers. Dickson also show the location of any flaws in the roll. (Figure Seventeen).

The Nolan Group has its own barcoding system. Upon delivery to the warehouse, each roll is bar-coded, which is the linkage to the original Nolan Group Order number, and all other records in the supply chain. The "date of last transaction" may be for example, when the container was received, or the roll itself receipted into a particular warehouse.

When the roll or a cut length is sold to a fabricator, a label is attached to the parcel, which is also bar-coded and referenced on the delivery docket and invoice; and linked to the customer order number. Thus, the origin of the material can be traced from any of these records, enabling for example, delivery of additional material from the same batch, should this be required.

The barcode shows the full production 'matriculation number'. The first five digits (M7902) are the batch number.

Below the identification of the range (i.e. "Max") and colour (i.e. Rouge) is the colour number (3914) and roll width (120 cm). The number to the right is the location (i.e. 22.4 m along the roll) of the single flaw in this particular roll.

The barcode is repeated at the base of the label. The digit in the bottom right hand corner is the number of flaws in the roll. The maximum number allowable is three.

Figure Seventeen- Dickson Product Labelling

Table Four Roll Dimensions, Weights and Packaging

Product	Roll Width	Roll Length	Fabric Weight	Roll Weight	Roll Diameter	"Cubic"	Packaging Description
Bradmill 'Brella'	220 cm	35 m	500 gsm	39 kg	17 cm	0.064 m^3	Wrapped in heavy duty plastic
Hunter Douglas	220 cm	35 m	498 gsm	38 kg	18 cm	0.071 m^3	
Hunter Douglas	280 cm	25 m	498 gsm	35 kg	14 cm	0.055 m^3	
Dickson Orchestra	120 cm	60 m	290 gsm	21 kg	20 cm	0.048 m^3	
Orchestra Max	120 cm	60 m	320 gsm	23 kg	21 cm	0.053 m^3	
Orchestra Stripe	120 cm	60 m	290 gsm	21 kg	20 cm	0.048 m^3	
Orchestra Jacquard	120 cm	60 m	320 gsm	23 kg	22 cm	0.058 m^3	
Dickson Spark FR	120 cm	60 m	290 gsm	21 kg	21 cm	0.141 m^3	
Dickson Infinity	120 cm	40 m	290 gsm	14 kg	21 cm	0.053 m^3	Packaged in a cardboard carton
Glen Raven 'Sunbrella®'	203 cm	45 m	310 gsm	28 kg	22 cm	0.097 m^3	Wrapped with corrugated cardboard and heavy duty plastic
Glen Raven 'Sunbrella® Plus'	203 cm	42 m	340 gsm	29 kg	21 cm	0.088 m^3	
Glen Raven 'Sunbrella®'	152 cm	50 m	310 gsm	24 kg	22 cm	0.074 m^3	Wrapped in heavy duty plastic
Glen Raven 'Sunbrella® Plus'	152 cm	45 m	340 gsm	23 kg	21 cm	0.067 m^3	
Vistaweave 95	270 cm	30 m	530 gsm	43 kg	21 cm	0.119 m^3	Packaged in a heavy duty cardboard tube with end caps
Vistaweave 95	320 cm	25 m	530 gsm	42 kg	21 cm	0.141 m^3	
Vistaweave 99	300 cm	20 m	710 gsm	43 kg	21 cm	0.132 m^3	
Vistaweave Stripe	270 cm	30 m	500 gsm	41 kg	21 cm	0.119 m^3	

Physical Properties

The physical specifications for the Nolan Group Blind and Awning products are tabulated in Tables Six through Nine. These specifications form the basis of the "Fit for Purpose" statement and are the foundation of the product warranties. Not all these products have been tested to Australian Standards, but the methods of tests are similar, and a description of these can be found in Technical Guide Number One.

Dickson® acrylic is manufactured in France, and the Orchestra and Spark FR specifications (Table Six) are drafted and tested to those of the International Standards Organisation (ISO). Sunbrella® is manufactured in the United States, and its specifications (Table Seven (A)) are founded on the standards of the American Society of Testing Materials (ASTM). Some properties of Sunbrella® have been independently tested to Australian Standards (Table Seven (B)). Both Bradmill and Hunter Douglas manufacture their polycotton canvas in Australia to Australian Standards. Vistaweave, although manufactured in China, also has a specification drafted to meet Australian Standards.

Accelerated Weathering Tests

Both acrylic and polyester yarns loose strength after UV exposure, and hence the tear and tensile properties of fabrics constructed of them can be expected to decline over time. Thus, the values in the respective specifications in Tables Six through to Table Nine represent the optimum starting point.

For this reason, accelerated UV testing was undertaken on representative fabrics, including Sunbrella® and Sunbrella® Plus. Samples from the same batch were subject to tear and tensile tests before and after exposure in an Atlas Weatherometer to a Xenon arc light source at 500 Watts for 1344 hours. The results are shown in Table Five.

Table Five Strength Loss of Outdoor fabrics After Accelerated Weathering

Fabric	Breaking Force (AS 2001.2.3)		Tear Strength (BS 3424.5)	
	Warp	Weft	Warp	Weft
Sunbrella®	0.0%	-12.5%	-9.4%	-20.0%
Sunbrella® Plus	0.0%	0.0%	-15.5%	-6.9%
Herculite 2000	-9.3%	-12.5%	-20.5%	-3.3%

The results for Sunbrella® and Sunbrella® Plus in Table Five could be considered indicative of those for Orchestra and Orchestra Max respectively, as their construction is similar. Testing has not been carried out on Vistaweave mesh, but has been on PVC laminated polyesters, the results of which logically can be roughly corelated with the values for Herculite 2000 shown in Table Five. No tests have been carried out on Bradmill and Hunter Douglas polycotton canvas.

Table Six Dickson Product Specifications

Properties	Test Method	Units	Orchestra	Orchestra Max	Infinity	Jacquard (Opera)	Spark FR
Weight	ISO 3801	g/m²	290	320	290	330	335
Tensile strength	ISO 13934-1	N/50 mm					
Warp			1400	1540	1150	1800	2200
Weft			900	1050	1150	900	2100
Elongation at break	ISO 13934-1	%					
Warp			35	37	25	25	52
Weft			30	32	15	26	40
Tear strength (Wing-Rip)	ISO 13937-1	Newtons					
Warp			40	30	40	53	70
Weft			23	20	30	30	25
Elongation under constant load (250N/5cm for 30 minutes)	ISO 13561	%					
Warp			3.0	3.0	4.0		2.0
Weft			7.0	7.0	4.0		6.0
Rigidity	ISO 2493	Newtons					
Warp			1.25	0.95	1.25	3.0	0.53
Weft			0.88	0.68	0.88	1.3	0.50
Schmerber (Water Penetration Resistance)	ISO 811	mm	>370	1200	>300	200	350
Oil-resistant properties	ISO 14419	class /8	5	5	4	4	4
Colour fastness UV: Indoor	ISO 105 B02	class /8	7-8	7-8	7-8	7-8	4-5
Colour fastness UV: Outdoor	ISO 105 B04	class /5	4-5	4-5	4-5	4-5	4-5
Colour fastness under dry friction	ISO 105X12	class /5	5	5	5	5	
Colour fastness under wet friction	ISO 105X12	class /5	5	5	5	5	

Table Seven (A) SunbrellaProduct Specifications (US Standards)

Properties	Test Method	Unit	Sunbrella®	Sunbrella® Plus
Fabric Construction: Ends	ASTM D3775-98	Per Inch	76	76
Fabric Construction: Picks	ASTM D3775-98	Per Inch	36	36
Fabric Weight	ASTM D3776-96	Oz/Square Yard	9.00	10.0
Finished Fabric Width	ASTM D3774-96	Inches	60.0	60.0
Hydrostatic Test	AATCC 127-1998	cm	40.0	150.0
Oil Repellency	AATCC 118-1997	Grade	5	5
Spray (large)	AATCC 22-200	Rating	100 Front 100 Back	100 Front
Break Strength	ASTM D5034-95	Lbs. of Force	285 Warp 180 Weft	300 Warp 200 Weft
Tear Strength (wing rip)	ASTM D2261-96	Lbs. of Force	12 Warp 8 Weft	12 Warp 8 Weft
Tabor Stiffness	ASTM D1388-96	Tabor Unit	12.0	Not tested
Wyzenbeek Abrasion-Wire Screen	ASTM D4157-92	Cycle	40,000 Warp 40,000 Weft	40,000 Warp 40,000 Weft
Fire Retardancy	TB 117-2013	Pass/Fail	Meets Class 1 Requirements	Meets Class 1 Requirements
California Technical Bulletin #117	AATCC 169-2003 Option 3	Grade	Grade 4 @ 2200 Kj	Grade 4 @ 2200 Kj
Colorfastness to Light	SAE 1960J	Grade	Grade 4/5 @ 1500 Kj	Grade 4/5 @ 1500 Kj

Table Seven (B) Sunbrella Product Specification (Australian Standards)

Properties	Test Method	Unit	Sunbrella®	Sunbrella® Plus
Fabric Weight		gsm	314	340
Finished Fabric Width		cm	152; 203*	152; 203*
Hydrostatic Test	AS 2001.2.17	kilopascal	3.4	24
Break Strength	AS 2001.2.3	Newtons/50 mm	1358 Warp 797 Weft	1334 Warp 860 Weft
Elongation at Break	AS 2001.2.3	% change in length	36 Warp 33Weft	27 Warp 28 Weft
Tear Strength (tongue tear)	BS 3424 pt 5	Newtons	96 Warp 55 Weft	84 Warp 58 Weft

***Note:** Limited colour choices in the 203 cm width option.

Table Eight Polycotton Canvas Specifications

Properties	Test Method	Unit of Measure	Brella Classic	Hunter Douglas
Fibre Content		Percent	52% Polyester; 48% cotton	52% Polyester; 48% cotton
Finished Weight		gsm (oz/sq yd)	500 (14.7)	498 ± 10
Finished Width		cm	220	220 and 280
Breaking Force	AS 2001.2.3A	N/50 mm	2600 warp; 1450 weft	2315 warp; 1700 weft
Tear Strength (wing rip)	AS 2001.2.10	Newtons	80 warp; 50 weft	50 warp; 30 weft
Shrinkage		%	-4.0 warp; +0.2 weft	-4.0 warp; +0.2 weft
Colour Fastness	AS 2001.4.21	Range:1 to 7	7	6-7
Light Fastness	AS 2001.4.21	Range:1 to 7	7	6-7
Oil Repellancy		Range:1 to 7	6	
Spray Rating	AS 2001.2.16	Rating	80	

Table Nine Vistaweave Specifications

Properties	Test Method	Unit of Measure	Vistaweave 95	Vistaweave Stripe	Vistaweave 99
Construction		%	70% polyester; 30% PVC	70% polyester; 30% PVC	70% polyester; 30% PVC
Pick count		Yarns/inch	37 x 35 (2x2)	36 x 16 (2x1)	36 x 24 (2x2)
Finished Weight		gsm	530 ± 25	500 ± 20	710 ± 30
Finished Width		cm	270 and 320	270	300
Breaking Force	AS 2001.2.3A	N/50 mm	2441 Warp; 2558 weft	2400 Warp; 980 weft	4400 Warp; 2600 weft
Tear Strength (Trapezoidal)	AS 3706.3		260 Warp; 267 Weft	320 Warp; 110 Weft	470 Warp; 260 Weft
Flex Cracking	AS 1441.6	Cycles	400,000	400,000	400,000

Table Ten (A) Flexible Clear Calendered PVC (Rollclear) Specification

Properties	Test Method	Unit of Measure	0.5 mm UV 3S	0.75 mm UV 3.5S	1.0 mm UV 4S
Gauge		inches	0.020	0.030	0.040
Thickness		mm	0.5	0.75	1.00
Finished Weight		gsm	635	950	1270
Breaking Force	JIS K 6732	N/cm	136 MD; 135 TD	167 MD; 158 TD	250 MD; 227 TD
Elongation at Break	JIS K 6732	%	349 MD; 370 TD	460 MD; 450 TD	402 MD; 400 TD
Elastic modulus at Break	JIS K 6732	N/cm	57 MD; 55 TD	54 MD; 51 TD	100 MD; 94 TD
Tear Strength (Wing Rip)	JIS K 6732	Newtons	42 MD; 42 TD	49 MD; 47 TD	81 MD; 78 TD
Cold Crack	JIS K 6772	^{0}Celsius	-45 MD; -35 TD	-50 MD; -45 TD	-50 MD; -45 TD
Light Transmission	JIS K 7105	%	87.2	86.2	84.4
Accelerated Weather test	JIS A - 1415	Condition after 500 hours	No observable change	No observable change	No observable change

Note: : MD is the Machine Direction; TD is the Transverse Direction

Table Ten (B) Flexible Clear Extruded PVC (Rollglass) Specification

Properties	Test Method	Unit of Measure	0.75 mm UV 2.5S	1.0 mm UV 2S
Gauge		inches	0.030	0.040
Thickness		mm	0.75	1.00
Finished Weight		gsm	950	1270
Breaking Force	JIS K 6732	N/cm	201 MD; 182 TD	276 MD; 255 TD
Elongation at Break	JIS K 6732	%	338 MD; 347 TD	300 MD; 344 TD
Elastic modulus at Break	JIS K 6732	N/cm	97 MD; 92 TD	149 MD; 129 TD
Tear Strength (Wing Rip)	JIS K 6732	Newtons	51 MD; 48 TD	97 MD; 92 TD
Cold Crack	ASTM D-1593	^{0}Celsius	-41 MD; -36 TD	- 32 MD; -25 TD
Accelerated Weather test	JIS A - 1415	Condition after 500 hours	No observable change	No observable change

Note : MD is the Machine Direction; TD is the Transverse Direction

APPENDIX A1: Solar Transmission, Absorption and Reflection Characteristics of Vistaweave

The thermal performance of Vistaweave has been tested to ASHRAE 74-75 1988. This test, developed by the American Society of Heating, Refrigerating and Air Conditioning Engineers, has been superseded by the International Standards (EN 14500 and EN 14501), but the results are still valid as a measure of solar properties, and for Vistaweave are tabulated in Tables A1, A2 and A3.

The test simulates the effects of impinging radiation, with the material placed in front of a glass sheet (Figure A1), and measurements are taken of the quantum of radiation Transmitted (Ts), Reflected (Rs) and Absorbed (As), each expressed as a percentage. The sum of these three factors should equal 100%, but there are errors of measurement, which are apparent in some of the results. The test also measures the amount of Ultraviolet light transmitted through the material (Tuv) and the glass, as well as heat gain, expressed as a Shading Co-efficient (Sc), which is the ratio of the solar heat gain through the fabric and the glass pane, to that of the glass pane only. The lower the value, the better the resistance to heat gain.

EN 14500 also measures the same solar properties, and the data is used in another technical software program (WINDOW 7.7) to calculate the Solar Heat Gain Co-efficient (SHGC), rather than the Shading Co-efficient (Sc). The difference is that the former takes into account the frame of the glazing assembly, and not just the glass. The two measures are similar but cannot be directly co-related. However, in the case of a simple pane of clear 3mm glass, Sc = 1.0 and the equivalent SHGC = 0.87.

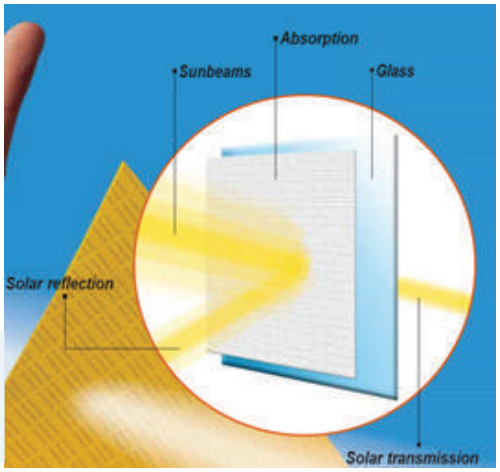


Figure A1– Measuring the Solar Protection Offered by an Outdoor Blind Material

Table A1 Solar Properties of Vistaweave 99 (Openness Factor of 1%, and 3mm Glass Pane)

Colour	Ts	Rs	As	Tv	Tuv	Sc
Woodland Grey ®	9	33	58	8	2	0.39
Classic Cream ®	10	31	50	10	1	0.41
Paperbark ®	9	20	75	8	2	0.43
Storm	7	16	77	6	1	0.48
Gunmetal	5	15	81	6	1	0.50
Caramel	7	18	75	7	1	0.51
Cappuccino	7	18	75	7	1	0.53
Charcoal	3	14	86	3	1	0.58
Ebony	2	13	95	2	1	0.61

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Table A2 Solar Properties of Vistaweave 95 (Openness factor of 5%, and 3mm Glass Pane)

Colour	Ts	Rs	As	Tv	Tuv	Sc
Snow	22	64	14	21	7	0.36
Surfmist®	8	61	20	19	6	0.38
Jasper®	10	12	81	12	7	0.38
Porcelain	18	61	21	19	6	0.38
Shale Grey®	16	45	37	17	7	0.42
Cappuccino	15	37	48	17	6	0.44
Oyster	16	50	34	17	7	0.44
Classic Cream®	9	10	75	15	6	0.49
Dune®	15	38	48	14	7	0.50
Green Tea	14	36	50	15	7	0.53
Mist	12	30	58	14	7	0.58
Ash Grey	13	30	57	14	7	0.58
Fed Green	7	9	84	12	6	0.60
Taupe	12	24	64	14	7	0.60
Grecian Gold	10	23	67	46	7	0.61
Copper	8	20	72	35	6	0.62
Caramel	8	13	80	12	6	0.64
Windspray	11	26	62	14	6	0.67
Congo	6	10	84	45	7	0.68
Storm	7	13	79	11	7	0.68
Pewter	7	14	79	11	7	0.68
Cobalt	5	7	88	9	6	0.70
Steel Blue	6	8	86	9	6	0.70
Chinaberry	6	8	86	10	6	0.70
Paperbark®	7	8	84	11	6	0.70
Wallaby®	8	9	79	13	6	0.70
Pepper	7	9	84	10	6	0.71
Cocoa	7	8	87	17	7	0.71
Woodland Grey	7	8	89	12	6	0.71
Gunmetal	6	6	88	10	6	0.72
Flint	6	5	89	10	6	0.73
Charcoal	6	5	89	10	6	0.73
Ironstone®	6	6	88	10	6	0.73
Basalt®	6	7	87	11	7	0.73
Ebony	7	4	89	10	6	0.74

Table A3 Solar Properties of Vistaweave Stripe (Openness Factor of 12%, and 3mm Glass Pane)

Colour	Ts	Rs	As	Tv	Tuv	Sc
T832	23	58	19	22	9	0.42
T115	13	25	62	15	8	0.49
T044	20	50	30	31	9	0.67
T113	21	56	23	19	9	0.67
T294	20	49	31	23	9	0.70
T232	18	39	43	20	8	0.73

The data in the previous tables are ranked by the 'Shading Co-efficient' (Sc), because theoretically this is the key indicator of solar heat gain. However, in the test, the shading material is placed in close proximity to the glass, which allows heat absorbed by the mesh to be re-radiated inwards through the glass. Because of this effect, the lighter colours which have high Reflection (Rs), perform better than the darker colours, which have high Absorbance (As). However, the greater the separation of the mesh and the glass, the less the effect of this secondary heat transfer, and in the practical case of outdoor blinds, where there is usually a seperation of at least a couple of metres or so, it would be negligible.

For this reason, the Radiation Transmitted (Ts) is a better measure of the solar heat gain for outdoor blind fabric selection, even though it includes the Ultraviolet and Visible Light Spectrum, and not just the infra-red. In this context, the high absorbing, generally darker colours tend to perform better than the high reflecting, generally lighter colours. This correlation has been confirmed with solar heat (i.e. infra-red) transmittance testing of shadecloth, without a glazing substrate.

APPENDIX A2: Thermal and Optical Properties of Dickson Acrylic Fabrics

Dickson Constant have been independently tested to the European Standards EN 14500 and EN 14501 for the Solar Transmission, Absorption and Reflection Characteristics of their acrylic ranges. The first standard EN 14500 defines the test methods used and is now accepted worldwide as the appropriate method of test, superseding other standards, such as the US standard ASHRAE 74-75 1988. The second standard EN 14501 (Blinds and Shutters, Thermal and Visual Comfort, Performance Characteristics and Classification) rates the expected performance requirements for thermal, visual and Ultraviolet transmission.

The EN 14501 standard defines the Total Solar Factor (gtot) which is the percentage of solar energy which penetrates into a room through a window shaded by fabric, mounted either on the inside or on the outside. The gtot value is expressed as an index between zero and one, and the closer the value to zero, the better the fabrics performance. Even an unprotected window reflects some solar radiation, and g = 0.59 for 3mm glazing without fabric.

Solar radiation impinges at different wavelengths, which are generally grouped into three categories, namely ultra violet, visible light, and infra-red as shown in Figure A2. In addition to the Total Solar Factor (i.e. gtot value) the EN 1500 tests measure the specific percentage values reflected, absorbed or transmitted (refer Figure A1) within these wavelength groupings.

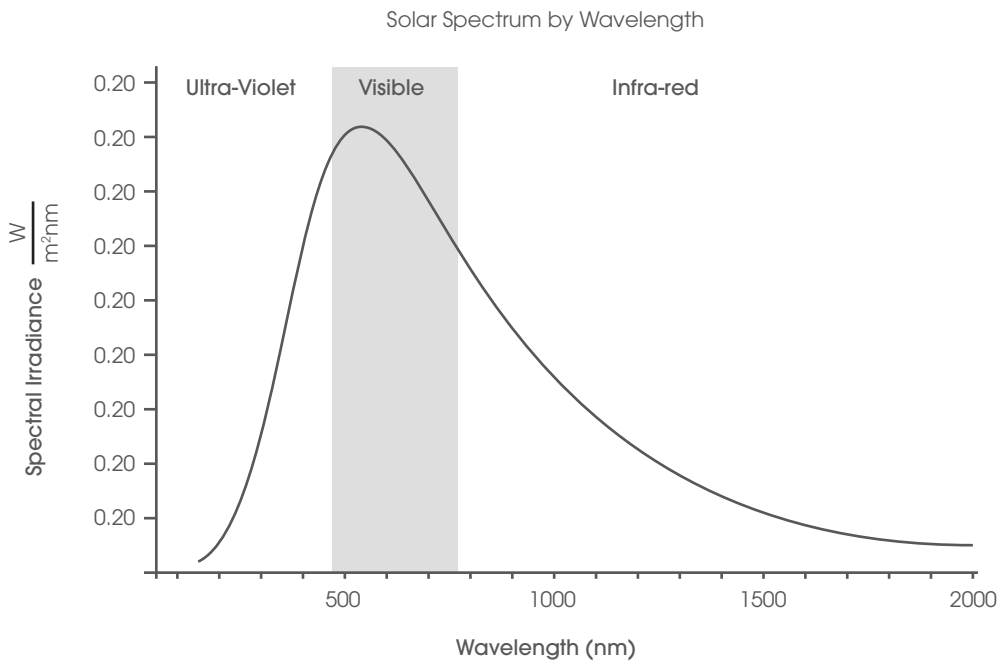


Figure A2- Solar Spectrum Wavelength

The results for the Dickson® fabrics are listed in Tables A4, A5, A6 and A7. For each fabric, the following results are presented:

gtot (External)	Total Solar Factor for the fabric mounted outside the glazing, with the face of the fabric toward the sun.
gtot (Internal)	Total Solar Factor for the fabric mounted inside the glazing, with the face of the fabric away from the sun.
τ_e	Heat Transmitted (%)
ρ_e	Heat Reflected (%)
α_z	Heat Absorbed (%)
τ_v	Visual Light Transmitted (%)
ρ_v	Visual Light Reflected (%)
α_v	Visual Light Absorbed (%)
τ_{uv}	Ultraviolet Light Transmitted (%)

Externally mounted fabrics offer better thermal protection than those mounted internally, because the solar radiation, which is partly absorbed (αe) by the fabric before reaching the glazing, is reflected outwards. Dark colours protect better against the heat than light colours because they absorb more solar energy (higher αe). Conversely, light colour are more efficient mounted internally. They absorb less heat (lower αe) and reflect it more (higher ρe) than dark colours.

Table A4 Thermal and Optical Properties of Dickson® Orchestra (Fabrics Ranked by External Efficiency)

		External	Internal	Infra-red (Heat) Spectrum			Visual Light Spectrum			UV
Colour #	**Colour**	***gtot***	***gtot***	τ_e (%)	ρ_e (%)	α_e (%)	τ_v (%)	ρ_v (%)	α_v (%)	τ_{uv} (%)
7559	Taupe	0.05	0.49	1	19	80	0	16	84	1
8203	Slate	0.05	0.51	1	14	85	0	11	89	0
D108	Manosque Dk Grey	0.05	0.51	1	14	85	0	11	89	0
U104	Flanelle	0.05	0.51	1	14	85	0	17	83	1
8238	Deep Navy	0.05	0.53	0	6	94	0	2	98	0
6687	Forest Green	0.05	0.53	0	7	93	0	5	95	0
6028	Black	0.05	0.55	0	2	98	0	2	98	0
7330	Charcoal Tweed	0.05	0.53	1	8	91	1	8	92	2
0017	Royal Blue	0.06	0.49	3	19	78	0	6	94	0
8201	Fern	0.06	0.49	3	22	75	1	19	80	0
7264	Ocean Blue	0.06	0.49	3	19	77	0	4	96	0
8779	Heather Chine	0.06	0.47	4	27	69	1	21	78	0
6088	Grey	0.07	0.45	5	32	63	4	29	67	1
D113	Naples Grey	0.07	0.45	5	32	63	4	29	67	0
8396	Lead Chine	0.07	0.45	5	32	63	4	28	68	2
8206	Burgundy	0.08	0.47	7	29	64	0	5	95	0
D308	Naples Dark Grey	0.08	0.52	1	14	85	0	13	87	0
7552	Pewter	0.08	0.44	8	37	55	5	33	62	2
D103	Manosque Beige	0.08	0.44	8	37	55	5	33	62	0
D319	Pencil Dark Grey	0.08	0.51	1	17	81	1	12	87	0
D330	Color Bloc Black	0.08	0.53	1	10	89	0	9	91	0
U095	Basalte Chiné	0.08	0.55	0	5	95	0	5	95	0
U321	Granny Chiné	0.08	0.51	1	18	82	0	17	83	0
U343	Pepper	0.08	0.54	0	7	92	0	6	94	0

Table A4 (Continued) Thermal and Optical Properties of Dickson® Orchestra (Fabrics Ranked by External Efficiency)

		External	Internal	Infra-red (Heat) Spectrum			Visual Light Spectrum			UV
Colour #	**Colour**	***gtot***	***gtot***	τ_e (%)	ρ_e (%)	α_e (%)	τ_v (%)	ρ_v (%)	α_v (%)	τ_{uv} (%)
U373	Macadam Tweed	0.08	0.54	0	7	92	0	6	94	0
U406	Steel	0.08	0.52	0	13	86	0	11	89	0
U407	Platinum	0.08	0.50	3	21	76	1	18	81	1
U417	Larch	0.08	0.53	1	11	88	0	7	93	0
U171	Carbone	0.08	0.49	7	22	71	0	7	93	0
3914	Paris Red	0.08	0.46	8	31	61	0	7	93	0
D331	Color Bloc Blue	0.09	0.51	3	18	80	0	8	92	0
D332	Color Bloc Orange	0.09	0.47	5	31	64	1	16	83	0
D334	Color Bloc Brown	0.09	0.50	4	21	75	1	14	85	0
U137	Vison Tweed	0.09	0.49	4	24	71	1	18	81	0
U235	Thatch	0.09	0.52	2	13	85	0	8	92	0
U224	Brownie	0.09	0.55	0	5	60	0	4	97	0
7244	Amande	0.09	0.44	10	36	54	5	31	64	0
D298	Wide Chiné Grey	0.10	0.47	6	32	62	6	33	61	3
0020	Red	0.10	0.44	11	38	51	1	13	86	0
D327	Craft Blue	0.10	0.48	6	28	66	1	19	80	1
D329	Craft Red	0.10	0.48	5	26	69	1	11	88	0
D335	Color Bloc Red	0.10	0.45	8	37	55	1	12	87	0
U408	Titanium	0.10	0.46	7	33	61	4	29	67	2
U411	Carmine	0.10	0.47	6	29	65	0	7	93	0
U413	Potiron Piqué	0.10	0.45	7	35	58	0	16	84	0
D306	Naples Hemp	0.10	0.46	8	35	57	2	24	74	1
D309	Manosque Grey	0.10	0.45	9	37	55	8	37	55	4
D104	Manosque Green	0.11	0.44	12	38	50	12	36	52	1
0681	Dune	0.11	0.43	13	43	44	9	40	51	1
8904	Linen	0.11	0.40	14	52	34	7	43	50	3
D321	Pencil Blue	0.11	0.44	9	39	52	3	28	69	1
D328	Craft Grey	0.11	0.44	9	39	53	6	35	59	2
8902	Beige	0.11	0.43	13	41	46	10	38	52	1
U189	Beige Tweed	0.11	0.43	13	41	46	10	38	52	6
D304	Naples Light Grey	0.11	0.43	11	43	46	11	37	52	5
D107	Manosque Yellow	0.11	0.42	14	45	41	8	40	52	0
D305	Naples Heather	0.11	0.44	11	41	48	6	34	60	1
6196	Stone	0.12	0.41	15	48	37	14	48	38	5
U105	Gold	0.12	0.43	15	41	44	2	34	64	0
D322	Pencil Green	0.12	0.43	12	42	46	8	38	54	1
U140	Gazelle Tweed	0.12	0.44	12	41	47	7	35	58	1
U370	Papyrus Tweed	0.12	0.42	13	46	41	11	41	49	4
U388	Azure	0.12	0.44	11	40	49	2	22	76	0
U410	Mocha	0.12	0.46	10	34	55	1	15	84	0
D307	Naples Linen	0.13	0.42	14	46	41	11	47	42	4
8931	Sienne Dark Grey	0.13	0.42	16	46	37	16	45	39	5
8614	Hardelot Green	0.13	0.41	17	46	37	16	45	40	4

Table A4 (Continued) Thermal and Optical Properties of Dickson® Orchestra (Fabrics Ranked by External Efficiency)

		External	Internal	Infra-red (heat) Spectrum			Visual Light Spectrum			UV
Colour #	**Colour**	***gtot***	***gtot***	τ_e (%)	ρ_e (%)	α_e (%)	τ_v (%)	ρ_v (%)	α_v (%)	τ_{uv} (%)
0018	Orange	0.13	0.42	17	44	39	5	26	69	1
U414	Honey	0.13	0.42	15	48	37	7	38	56	0
D300	Wide Chiné Yellow	0.13	0.41	16	51	34	12	49	39	4
8211	Sienne Red	0.14	0.41	18	49	33	16	42	43	5
8556	BS Navy	0.14	0.42	18	43	39	18	42	40	5
8935	Hardelot Beige	0.14	0.40	19	50	31	18	49	33	6
D100	Sienne Beige	0.14	0.41	18	47	35	19	46	35	0
D320	Pencil Grey	0.14	0.41	17	51	32	13	45	42	5
D324	Pencil Beige	0.14	0.41	16	49	35	10	42	48	2
U409	Marble	0.14	0.41	16	50	34	16	49	35	8
U415	Maize	0.14	0.41	18	51	31	11	48	41	0
8910	BS Blue	0.14	0.41	19	49	32	19	45	36	6
7972	Pearl	0.14	0.39	20	54	26	18	53	29	8
8922	BS Slate	0.15	0.40	20	52	28	20	55	25	6
6020	Raw	0.15	0.39	21	56	23	19	54	27	6
8907	BS Grey	0.15	0.39	21	55	24	20	55	25	7
6316	Yellow	0.15	0.40	21	50	29	17	49	34	1
U190	Grey Tweed	0.15	0.38	21	58	21	20	58	22	5
U389	Chalk Tweed	0.15	0.39	21	57	23	20	57	23	10
8612	Hardelot Yellow	0.15	0.39	22	55	24	20	54	26	5
U335	Gypsum	0.16	0.39	21	56	23	0	50	50	5
U387	Clay	0.16	0.41	20	50	30	12	40	48	3
U136	Alabaster Tweed	0.17	0.37	23	61	16	22	60	18	7
8553	BS Yellow	0.17	0.38	25	59	16	24	60	16	7
7133	Natural	0.18	0.37	27	62	12	28	63	9	9
0001	White	0.18	0.36	27	64	9	28	65	7	10

Table A5 Thermal and Optical Properties of Dickson® Orchestra (Fabrics Ranked by External Efficiency)

		External	Internal	Infra-red (heat) spectrum			Visual Light spectrum			UV
Colour #	**Colour**	**gtot**	**gtot**	**τ_e (%)**	**ρ_e (%)**	**α_e (%)**	**τ_v (%)**	**ρ_v (%)**	**α_v (%)**	**τ_{uv} (%)**
6028	Black	0.04	0.56	0	2	98	0	2	98	0
6687	Forest Green	0.04	0.54	0	7	93	0	5	95	0
7559	Taupe	0.04	0.50	1	19	80	0	16	84	1
8203	Slate	0.04	0.52	1	14	85	0	11	89	0
U104	Flanelle	0.04	0.52	1	14	85	0	17	83	1
8779	Heather Chine	0.05	0.48	4	27	69	1	21	78	0
D113	Naples Grey	0.06	0.46	5	32	63	3	29	68	0
7264	Ocean Blue	0.06	0.49	3	19	77	0	4	96	0
3914	Paris Red	0.07	0.47	7	31	61	0	7	93	0
8206	Burgundy	0.07	0.48	6	29	65	0	5	95	0
8396	Lead Chine	0.07	0.49	3	28	69	3	28	69	2
D308	Naples Dark Grey	0.08	0.52	1	14	85	0	13	87	0
U171	Carbone	0.08	0.50	0	9	91	0	7	93	0
U224	Brownie	0.08	0.47	9	31	61	0	3	97	0
0681	Dune	0.10	0.44	12	43	46	9	40	52	1
U413	Pumpkin	0.10	0.45	7	35	58	0	16	84	0
6196	Stone	0.11	0.42	13	48	38	13	48	39	5
8931	Sienne Dark Grey	0.12	0.43	15	46	39	14	45	41	5
D307	Naples Linen	0.13	0.42	14	46	41	11	47	42	4
8211	Sienne Red	0.13	0.42	16	49	34	14	42	44	5
6020	Raw	0.14	0.40	19	56	25	17	54	29	6
U409	Marble	0.14	0.41	16	50	34	16	49	35	8
U415	Maize	0.14	0.41	18	51	31	11	48	41	0
U387	Clay	0.16	0.41	20	50	30	12	40	48	3
0001	White	0.17	0.37	24	64	12	25	65	10	10
7133	Natural	0.17	0.38	24	62	14	25	63	12	9

Table A6 Thermal and Optical Properties of Dickson® Infinity (Fabrics Ranked by External Efficiency)

		External	Internal	Infra-red (heat) spectrum			Visual Light spectrum			UV
Colour #	**Colour**	**gtot**	**gtot**	**τ_e (%)**	**ρ_e (%)**	**α_e (%)**	**τ_v (%)**	**ρ_v (%)**	**α_v (%)**	**τ_{uv} (%)**
7559	Taupe	0.05	0.49	1	19	80	0	16	84	1
8203	Ardoise	0.05	0.51	1	14	85	0	11	89	0
U104	Flanelle Chiné	0.05	0.51	1	14	85	0	17	83	1
6028	Noir	0.05	0.55	0	2	98	0	2	98	0
6088	Gris	0.07	0.45	5	32	63	4	4	92	1
8396	Souris Chiné	0.07	0.45	5	32	63	4	28	68	2
U171	Carbone	0.08	0.49	7	22	71	0	7	93	0
3914	Rouge	0.08	0.46	8	31	61	0	7	93	0
U253	Atlantique	0.09	0.52	2	15	82	0	3	97	0
U418	Forêt	0.09	0.54	0	8	92	0	4	96	0
0681	Dune	0.11	0.43	13	43	44	9	40	51	1
U419	Royal	0.11	0.49	7	24	69	0	6	94	0
6196	Pierre	0.12	0.41	15	48	37	14	48	38	5
6020	Grège	0.15	0.39	21	56	23	19	54	27	6
0001	Ecru	0.18	0.36	27	64	9	28	65	7	10

Table A7 Thermal and Optical Properties of Dickson Spark (Fabrics Ranked by External Efficiency)

		External	Internal	Infra-red (heat) spectrum			Visual Light spectrum			UV
Colour #	**Colour**	**gtot**	**gtot**	**τe (%)**	**ρe (%)**	**αe (%)**	**τv (%)**	**ρv (%)**	**αv (%)**	**τuv (%)**
U426	Cendre	0.08	0.53	1	11	88	0	9	91	0
U164	Carbone	0.09	0.56	0	3	98	0	3	98	0
U427	Charbon	0.09	0.55	0	5	95	0	5	95	0
U423	Kraft	0.14	0.46	15	35	50	12	34	55	0
U424	Poussière	0.15	0.47	15	31	54	12	30	58	0
U159	Garance	0.16	0.46	19	34	47	1	8	91	0
U422	Brume	0.18	0.44	23	40	37	22	42	36	0
U421	Sisal	0.19	0.43	25	45	30	22	46	31	0
U150	Blanc	0.22	0.40	32	55	14	34	60	6	0

Printing of Dickson® and Sunbrella® Fabrics

While these acrylic textiles are mainly used for awnings and marine applications, it is possible to print on them, using different methods including:

- **Painting**
- **Inkjet printing**
- **DGS transfer (Digital Graphic System)**
- **Heat classical transfer**

Painting

This procedure is compatible with acrylic and polyester base fabrics, provided the instructions below are followed:

For manual printing:

- Spread acrylic fabric on a solid flat table or similar.
- Smooth out fabric to avoid any creasing.
- Draw the desired shape on the fabric with a special chalk for textiles.
- Paint edges of the drawing above chalk line with an acrylic paint and a hard 12-15 mm paintbrush.
- Coming from the edge of the drawing, and applying firm pressure, sweep in short strokes to and fro to create a clean edge.
- Fill the shape with paint. Apply firm pressure to ensure the paint seeps into the acrylic fabric. Allow paint to dry.
- Apply as many layers as required to override the original fabric color. Let fabric dry between each layer application.
- To avoid the paint going through the fabric, first layer may be tinted with a color similar to color of the acrylic fabric or made with a translucent lacquer.
- Let the last layer dry during 24 hours before exposure to rain and moisture.

For serigraphy (screen printing):

- Spread acrylic fabric on a solid flat table or similar.
- Smooth out fabric to avoid any creasing.
- Roll out the protective tape and position the stencil on the fabric. Press stencil on the textile.
- Apply firm pressure, with a smooth object, on the edges of the stencil, to help a good adhesion to the fabric.
- Paint the drawing with a hard 12-15 mm paintbrush. Paint from the stencil to the fabric to avoid any drip under the stencil. Firmly press to make paint seep into the fabric.
- Let the first layer dry. If the first layer makes a thick seal where stencil and fabric meet, apply the second layer using a softer paintbrush.
- Apply as many layers as required to override the original fabric color. Let paint dry between each application.
- Pull the stencil out after last layer, before the paint sets, to get a clean edge. If paint is allowed to set, part of the paint located on edge of the stencil could stick on the fabric.
- Let final layer dry for 24 hours before exposure to rain and moistur

A few suggestions:

- You can accelerate drying by using a hair-dryer
- Sunbrella® and Orchestra fabrics have been treated to be water-repellent. This finish will have a tendency to repulse paint and maintain it on the surface of the fabric therefore a high pressure is needed to seep paint among the yans.
- It is recommended to make a trial on a fabric sample before working on the proper job.

Inkjet Printing

Acrylic fabrics are not really suited for ink-jet printing, because the standard solvent inks are really designed for smooth surface, PVC impregnated fabrics. If it is contemplated, then the best results are obtained if a substrate is applied before printing.

DGS Transfer

This method is appropriate for acrylics and polyesters, provided the guidelines of machine manufacturer are strictly followed. Be aware though, that during this process, the fabric is exposed to temperatures of 85°C, which risks damaging it. Always try out the process on a test piece before undertaking the full job.

Heat Transfer Process

This method may be applicable for acrylics and polyesters; but because of its technicality, the printer should undertake his own research in this regard. More information can be found at CHEMICA (www.chemica.fr) and SEF (www.sef-france.com)

Application to Dickson® Products

Table B1 summarises the applicability of the various Dickson products. However, to obtain the best results, the printer will need to systematically fine tune the processes through trial and error.

Table B1 The Printability of the Dickson® Ranges

Method\Product	ORCHESTRA	Orchestra MAX	Spark FR
Paint	Yes	Yes	Yes
Solvated Ink Jet	Poor rendering (dull)	Poor rendering (slightly better on coated sites)	Poor rendering; avoid printing on coated side
UV Ink Jet	Average rendering and poor rubbing fastness	Average rendering (dull) rubbing fastness slightly better on coated side	Fairly poor rendering ; avoid printing on coated side
DGS	Yes	Yes	No
Heat Transfer	Yes ; poor rubbing fastness	Yes ; poor rubbing fastness	Yes ; poor rubbing fastness

APPENDIX C1: Cleaning Guide for Dickson® & Sunbrella® Acrylic Fabrics

Dickson® and Sunbrella® fabrics have all the necessary characteristics to use outside and you should not encounter any specific problems if you care for them properly.

It is strongly recommended that the awning be installed in a cassette case or under a protective top plate, in order to minimise the accumulation of dust and dirt.

The awning system should be positioned in such a way that there is sufficient tension of the fabric with no prospect of the fabric rubbing on the componentry. Tension is required to prevent pockets of water forming in the event of rain. In the event of high winds, retract the awning. In the rain, the awning can be left extended, but avoid retracting it damp and leaving it for a long period of time. If for a particular reason, it must be retracted when damp, extend it out again as soon as possible to allow it to dry.

One of the best ways to keep Dickson® and Sunbrella® fabrics looking good is to brush and hose fabrics off on a monthly basis with clear water. This practice will help prevent dirt from becoming deeply embedded in the fabric and eliminate the need for more frequent vigorous cleaning. In most environments, a thorough cleaning will be needed every two to three years.

General or Light Cleaning

- Brush off loose dirt and hose down.
- Prepare a cleaning solution of water and mild detergent.
- Use a soft bristle brush to clean.
- Allow cleaning solution to soak into the fabric.
- Rinse thoroughly until all detergent residue is removed.
- Air dry only. Never apply heat to Sunbrella® fabrics.

Heavy Duty Cleaning

If stubborn stains persist, you can use a diluted chlorine bleach/detergent mixture for spot cleaning of mildew, roof run-off or other similar stains (see Stain Chart for Glen Raven's specific recommendations).

Dickson® and Sunbrella® fabrics do not promote mildew growth per se; however, mildew may grow on dirt and other foreign substances that that have accumulated on the fabric. To clean mildew, or other stubborn stains:

- Prepare a solution of bleach (80ml), mild detergent (20ml) per litre of clean water.
- Soak affected area in solution for 15 minutes.
- Remove stain with a sponge or clean towel.
- Rinse thoroughly to remove all residue.
- Air dry.

Remember to protect the area around the fabric if using a bleach solution. Fabric cushions below the awning, or the thread in the awning itself, may have an adverse reaction to the bleach.

Re-treating the Fabric

As part of the finishing process, Dickson® and Sunbrella® fabrics are treated with a fluorocarbon finish, which enhances water repellency. This finish is designed to last for several years but must be replenished after a thorough cleaning. Based on test results, Glen Raven recommends 303 High Tech Fabric Guard™ as the preferred re-treatment product for Sunbrella® fabrics. Fabrics should be re-treated after thorough cleaning or after five years of use. For more information on re-treatment products, please visit www.303products.com.

Table C1 Acrylic Stain Cleaning Chart

Stain	Recommended Cleaning Solutions
Berry	20 ml liquid detergent, 30ml to 60ml white vinegar per litre of water.
Bird Droppings	20 ml liquid detergent per litre of water.
Charcoal, Pencil Marks	Vacuum, then clean with 20 ml liquid detergent per litre of water.
Chewing Gum	Treat with isopropyl alcohol. Then clean with 20 ml liquid detergent per litre of water.
Grease (Car)	Apply cornflour as an absorbent, remove excess, clean up with liquid detergent and water.
Ink (Permanent, India, Ballpoint)	Treat with volatile solvent (acetone 100%). Then clean with soap and water and rinse thoroughly.
Iron Rust	Treat with "Calcium Lime Rust" or and rinse thoroughly.
Mildew	Combine 20 ml liquid detergent and 80 ml bleach per litre of water.
Nail Polish	Treat with volatile solvent (acetone 100%). Then clean with soap and water and rinse thoroughly.
Oil	Apply cornflour as an absorbent, remove excess, clean up with liquid detergent and water.
Paint Wet / Dried (Latex, Oil, Lacquer)	Apply cornflour as an absorbent, remove excess, clean up with liquid detergent and water.
Suntan Lotion	Apply cornflour as an absorbent, remove excess, clean up with liquid detergent and water.
Tree Sap	Treat with solvent to soften (Turpentine) and remove as much of the tree sap as possible. Repeat as necessary. Then clean with soap and water and rinse thoroughly to remove solvent.
Urine	Combine 20 ml liquid detergent and 30 ml white vinegar per litre of water.
Vomit	Combine 20 ml liquid detergent and 30 ml white vinegar per litre of water.
Wax (Candle)	Combine 20 ml liquid detergent and 30 ml white vinegar per litre of water.

APPENDIX C2: Cleaning Guide for Polycotton Canvas

General Cleaning

To obtain maximum life from outdoor products incorporating Brella® or Hunter Douglas polycotton awning canvas, the following points should be noted:

- As a general rule, polycotton canvas awnings should be cleaned once or twice a year (the more regularly the better), particularly because air pollutants, dirt and grime can become embedded within the fabric interstices.
- Polycotton awning canvas should be kept clean by brushing dry fabric regularly with a soft brush/broom. Hose occasionally with cold water, but do not combine the actions of brushing and hosing as this may abrade coating and impart a scuffed appearance to the fabric once dry.
- Do not allow bird droppings, earth, sand or vegetable matter to remain in contact with the canvas.
- Do not apply soaps, detergents, cleaning fluids or insecticides
- Keep petrol, kerosene or other similar fluids away from the canvas
- Retractable awnings should not be rolled up when wet.
- If rolled up wet, Polycotton awning fabric should be opened up to dry as soon as practical to prevent mildew growth.
- Awnings constantly exposed to rain and moisture are particularly susceptible to mildew growth. Routine cleanings will help prevent mildew growth.
- Should mildew spots appear, brush them off before they become attached.
- Persistent mould or mildew growth should be treated with White King® solution, strictly in accordance with the instructions outlined below.
- To ensure that water and soil repellency is fully retained after fabric has endured continuous outdoor exposure or been cleaned extensively, the fabric should be reproofed with a water repellent compound. The water based Brella® reproofing compound is recommended for this purpose. Note: this is required when water penetrates the fabric rather than beading off it.

Use of White King® as Mildew Remover

White King® is a bleaching and cleansing agent which is effective in removing mildew growth on canvas and killing mildew spores.

Safety: Read the safety directions on the White King® label and follow these directions carefully. Wear rubber gloves and avoid contact with skin and eyes. Read all directions thoroughly before commencing.

As some awning fabrics are not colourfast, an inconspicuous section of the awning should be tested with the solution before proceeding as follows:

- Remove dust and dirt by lightly brushing. Heavy soiling should be washed off with clear warm water – do not use soap, detergents or other cleaning agents.
- White King® should be diluted with water, 1 part of White King® to 3 parts of water. It should not be mixed with other chemicals or cleaners.
- Apply this solution evenly to the outside at a rate that will penetrate the fabric, working the solution into the canvas with a soft brush or broom. Five litres of White King® solution will treat approximately ten square metres of canvas.
- Hose off the solution thoroughly after 15 minutes, continuing to hose down after run off is clear.
- If mildew is not completely removed, allow canvas to dry, then repeat the application.
- Do not allow the solution to remain on the canvas for more than 20 minutes without thoroughly rinsing or damage may occur.
- After completely drying, the canvas is pre-treated and ready for an application of Bradmill Outdoor Fabrics' BrellaGuard® reproofing compound

APPENDIX C3: Cleaning Guide for Vistaweave PVC Mesh

General Cleaning

Regularly clean Vistaweave with a solution of mild soap and water using a cloth or soft bristle brush. Rinse thoroughly with fresh water and allow the fabric to dry completely before rolling up the blind.

If satins and mould cannot be removed using this procedure, clean using a solution of bleach (5%) and water (95%). Rinse thoroughly with fresh water.

Do not use abrasive cloths or cleaners, or other chemicals or solvents that may attack the PVC coating. It is a resilient material, resistant to most inorganic liquids, including moderately concentrated acids and alkalis, and aqueous salt solutions. It is also unaffected by aliphatic hydrocarbons, the principal constituents of most oils and greases. It is attacked by powerful oxidising agents (such as hydrogen peroxide) acetone, alcohols and ammonia, chemicals sometimes found in some industrial cleaners.

APPENDIX C4: Cleaning Guide for Flexible Clear PVC

General Cleaning

The use of harsh chemicals for cleaning should be avoided as these can scratch the surface or attack the material. Clear PVC should be able to be cleaned easily with a diluted solution of mild soap and warm water, rising with clean water and drying with a soft cloth or a sponge; but better results can be obtained using IMAR brand Protective Cleaner (#301) and Protective Polish (#302). Vuplex is also suited as a cleaner.

Spray IMAR Protective Cleaner or Vuplex directly on the surface of the clear PVC or onto a soft cotton or micro fibre cloth. Gently wipe the surface to clean. If necessary, buff dry with another dry clean cloth. IMAR Protective Cleaner should be kept on hand for emergency spot cleaning of any liquids, creams, chemicals or sprays that contact the clear PVC surface.

When polishing, make sure the clear PVC blinds are clean and dry. Apply a light coat of IMAR Protective Polish with small, light circular motions using a soft cotton cloth or applicator pad. Allow the polish to quickly dry. Lightly buff with a dry soft cotton or microfibre cloth to a sparkling smooth shine. The IMAR Protective Polish should be applied as needed. Over time, with multiple applications, the polish will build up a strong protective barrier.

NEVER USE

- Windex, Cream Cleanser, Ajax Spray and Wipe, or any other harsh cleaner to clean clear PVC
- A car wax or any kind of wash and wax to protect clear PVC blinds.
- Cleaners, polishes, scratch removers, or any products intended for commercial grade vinyl or plastic.

APPENDIX C5: Molecular Structure and Chemical Resistance

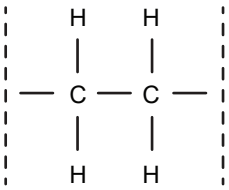
The chemical composition of acrylic is Polyacrylonitrile (CH_2CHCN). Acrylic fibre is resistant to most acids, alkalis, oxidizing agents, and solvents; with the exception of Nitic Acid, and solvents that are used in its production, such as Dimethylformamide.

The are many types of polyester, but the most common is Polyethylene Terephthalate (PET), which is formed from the esterification of terephthalic acid and glycol. Polyester fibre is resistant to most antioxidants, but is sensitive to strong alkalis, concentrated Nitric and Sulphuric acids, Nitrobenzene and Phenols.

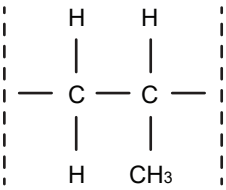
Cotton is a natural cellulosic fibre, that has a weak resistance against acids and alkalis (it will dissolve in concentrated Sulphuric Acid), but strong resistance against organic chemicals (e.g. Acetone).

Polyvinyl Chloride is a linear polymer comprised of a linked chain of C_2H_3Cl molecules. The addition of plasticisers, which are synthetic oils, softens and adds pliability to the otherwise rigid material. The most commonly used plasticisers are Phthalates (e.g. Di Octyl Phthalate (DOP) and Di-Iso Decyl Phthalate (DIDP). Clear flexible PVC is resistant to most inorganic liquids, including moderately concentrated acids and alkalis, and aqueous salt solutions. It is also unaffected by aliphatic hydrocarbons, the principal constituents of most oils and greases. It is attacked by powerful oxidising agents (such as hydrogen peroxide) acetone, alcohols and ammonia.

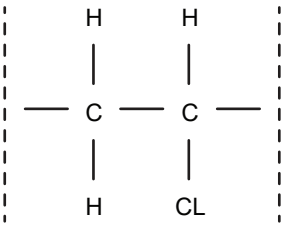
(a) Ethylene



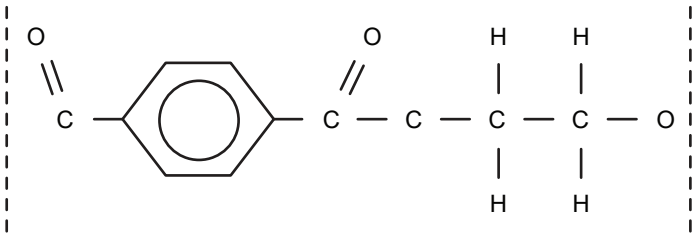
(b) Propylene



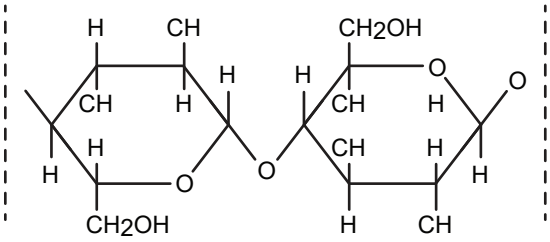
(c) Vinylchloride



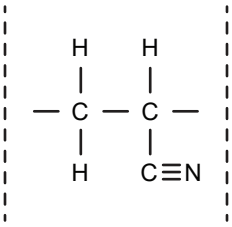
(d) Polyester



(e) Cotton



(f) Acrylonitrile



These monomers become polymers when the molecular group between the dashed lines are connected to other similar groups.

Nolan Group
Your Textile Partner For Success

Table C2 Compatibility of Fabrics and Flexible PVC Sheet with Common Chemicals (at Substantially Diluted Concentrations and Room Temperature)

Alkalis or bases	Acrylic	Polyester	Cotton	Clear PVC
Ammonia NH_3 or Ammonia Solution NH_4OH	✓×	××	××	××
Calcium Hydroxide $CaOH_2$ (Hydrated Lime)	✓✓	✓✓	✓✓	✓✓
Potassium Hydroxide KOH (Caustic Potash)	✓×	✓×	××	✓×
Potassium Carbonate K_2CO_3 (Potash)	✓×	✓×		✓✓
Sodium Hydroxide NaOH (Caustic Soda)	✓×	✓×	✓×	✓✓
Sodium Carbonate Na_2CO_2 (Washing Soda)	✓✓	✓✓	✓✓	✓✓
Sodium Bicarbonate $NaHCO_3$ (Baking Soda)	✓✓	✓✓	✓✓	✓✓
Acids				
Hydrochloric Acid HCl (Muriatic Acid)	✓✓	✓×	××	✓✓
Nitric Acid HNO_3	××	✓✓	××	✓×
Sulphuric Acid H_2SO_4	××	××	××	××
Acetic Acid $C_2H_4O_4$ (4% concentration in Vinegar)	✓✓	✓✓	✓✓	✓✓
Phenol C_6H_6O (Carbolic Acid)	✓×	✓×	✓×	✓×
Oxalic Acid $C_2H_2O_4$	✓✓	××	××	✓✓
Solvents				
Acetone C_3H_6O	✓✓	✓✓	✓✓	××
Benzene C_6H_6	✓✓	✓✓	✓✓	××
Ethyl Alcohol C_6H_6O	✓×	✓✓	✓✓	✓×
Isopropyl Alcohol C_3H_8O	✓✓	✓✓	××	✓×
Mineral Turpentine $C_{10}H_{16}$ (White Spirits)	✓✓	✓✓	✓✓	××
Tetrachloroethylene C_2Cl_4 (Dry cleaning fluid)	✓×	✓×	✓×	××
Trisodium Phosphate Na_3PO_4		✓✓		✓✓
Kerosene (Paraffin)	✓✓	✓✓	✓✓	✓✓
Petrol	✓✓	✓✓	✓✓	✓✓
Carbon Tetrachloride	✓×	✓×	✓×	××
Oxidising Agents				
Hydrogen Peroxide H_2O_2	✓✓	✓×	××	✓×
Sodium Hypochlorite NaOCl (Bleach)	✓✓	✓×	✓×	✓✓

✓✓ Compatible
✓× Limited Compatibility
×× Incompatible

APPENDIX D1: Dickson® and Sunbrella® Acrylic Awning Fabrics

The Nolan Group warrants that the Dickson® and Sunbrella® branded Acrylic Awning Fabrics are specifically designed to be used for awnings and blinds, and are guaranteed to be supplied free of defects.

'Free of defects' means that the products meet their published descriptions and technical specifications, and are homogeneous in appearance after allowance for minor variance that is inherently the result of the manufacturing process.

The Nolan Group further warrants that the products will perform satisfactorily when used in its design context in the temperate climatic conditions experienced throughout Australia.

'Satisfactorily' means with continued but gradually diminished utility over its expected life, due to the unavoidable effects of ultraviolet radiation and weathering, such as colour variation, strength loss, and dimensional change. Extreme climatic conditions, particularly high temperature and humidity, may accelerate this inevitable product degradation.

'Expected life' is at least the period covered by warranty, provided the products are installed properly, and cleaned and maintained as recommended.

The warranty specifically excludes imperfections such as mottling, waffling, and folds caused by handling during fabrication of the awning or its installation or its operation; mechanical fatigue due to wind load, and damage attributable to faulty design or installation, such as abrasion by componentry; or tear caused by undue concentration of stress at supports; to storm or cyclone events, including hail loading; and to vandalism.

The warranty period is TEN YEARS for Dickson® ORCHESTRA, ORCHESTRA MAX, INFINITY; and Sunbrella® Awning fabrics; and FIVE YEARS for Dickson SPARK FR.

The liability of the Nolan Group is limited under this warranty to replacement of material only, or refund of the original invoice price, both options with a discount on value for the time the fabric has been in place, on a pro-rata basis as follows:

The first half of the warranty period	**Nil Discount**
The third quarter of the warranty period	**50% Discount**
The final quarter of the warranty period	**75% Discount**

Liability for negligence (e.g. careless operation, inappropriate cleaning procedures), or for any consequential loss, including labour and installation, is expressly excluded.

In the event of a claim, proof of purchase must be provided. In the event of a dispute, the determination of the manufacturer or recognised industry association is the sole basis on which replacement or refund is made.

This limited warranty shall under no circumstances override legal guarantees that may be required under the Consumer Act. The warranty is not transferrable and applies only to the original purchaser.

The Nolan Group Warranty is independently supported by those of our Suppliers:

GLEN RAVEN Inc
1831 North Park Ave, Glen Raven NC 27217-1100 USA
www.glenraven.com

DICKSON CONSTANT SAS RCS
Lille Métropole - FRANCE
www.dickson-constant.com

APPENDIX D2: Polycotton Awning Canvas manufactured by Bradmill Outdoor Fabrics and Hunter Douglas

The Nolan Group warrants that the polycotton awning canvas manufactured by either Bradmill Outdoor Fabrics or Hunter Douglas is specifically designed to be used for awnings and blinds, and is guaranteed to be supplied free of defects.

'Free of Defects' means that the products meet their published descriptions and technical specifications, and is homogeneous in appearance after allowance for minor variance that is inherently the result of the manufacturing process.

The Nolan Group further warrants that the products will perform satisfactorily when used in its design context in the temperate climatic conditions experienced throughout Australia.

'Satisfactorily' means with continued but gradually diminished utility over its expected life, due to the unavoidable effects of ultraviolet radiation and weathering, such as colour variation, strength loss, and dimensional change. Extreme climatic conditions, particularly high temperature and humidity, may accelerate this inevitable product degradation.

'Expected life' is at least the period covered by warranty, provided the products are installed properly, and cleaned and maintained as recommended.

The warranty specifically excludes imperfections such as creasing and folds caused by handling during fabrication of the awning or its installation or its operation; mechanical fatigue due to wind load, and damage attributable to faulty design or installation, such as abrasion by componentry; or tear caused by undue concentration of stress at supports; to storm or cyclone events, including hail loading; and to vandalism.

The warranty period is FIVE YEARS for both Bradmill BRELLA; and Hunter Douglas Awning fabrics.

The liability of the Nolan Group is limited under this warranty to replacement of material only, or refund of the original invoice price, both options with a discount on value for the time the fabric has been in place, on a pro-rata basis as follows:

The first half of the warranty period	**Nil Discount**
The third quarter of the warranty period	**50% Discount**
The final quarter of the warranty period	**75% Discount**

Liability for negligence (e.g. careless operation, inappropriate cleaning procedures), or for any consequential loss, including labour and installation, is expressly excluded.

In the event of a claim, proof of purchase must be provided. In the event of a dispute, the determination of the manufacturer or recognised industry association is the sole basis on which replacement or refund is made.

This limited warranty shall under no circumstances override legal guarantees that may be required under the Consumer Act. The warranty is not transferrable and applies only to the original purchaser.

The Nolan Group Product Warranty is independently supported by those of our Suppliers:

Hunter Douglas Australia
338 Victoria Rd, Rydalmere NSW 2116
www.hunterdouglas.com.au

Bradmill Outdoor Fabrics
Unit 3 100 Fulton Drive Derrimut VIC 3030
www.bradmilloutdoor.com.au

APPENDIX D3: Vistaweave PVC coated Polyester Mesh

The Nolan Group warrants that Vistaweave PVC coated Polyester Mesh is specifically designed to be used for outdoor blinds, and is guaranteed to be supplied free of defects.

'Free of Defects' means that the products meet their published descriptions and technical specifications, and are homogeneous in appearance after allowance for minor variance that is inherently the result of the manufacturing process.

The Nolan Group further warrants that the products will perform satisfactorily when used in its design context in the temperate climatic conditions experienced throughout Australia.

'Satisfactorily' means with continued but gradually diminished utility over its expected life, due to the unavoidable effects of ultraviolet radiation and weathering, such as colour variation, strength loss, and dimensional change. Extreme climatic conditions, particularly high temperature and humidity, may accelerate this inevitable product degradation.

'Expected life' is at least the period covered by warranty, provided the products are installed properly, and cleaned and maintained as recommended.

The warranty specifically excludes imperfections such as creasing, folds, etc. caused by handling during fabrication of the blind or its installation or its operation; mechanical fatigue due to wind load, and damage attributable to faulty design or installation, such as abrasion by componentry; or tear caused by undue concentration of stress at supports; to storm or cyclone events, including hail loading; and to vandalism.

The warranty period is TEN YEARS for VISTAWEAVE 99, VISTAWEAVE 95, and VISTAWEAVE STRIPE.

The liability of the Nolan Group is limited under this warranty to replacement of material only, or refund of the original invoice price, both options with a discount on value for the time the fabric has been in place, on a pro-rata basis as follows:

The first half of the warranty period	**Nil Discount**
The third quarter of the warranty period	**50% Discount**
The final quarter of the warranty period	**75% Discount**

Liability for negligence (e.g. careless operation, inappropriate cleaning procedures), or for any consequential loss, including labour and installation, is expressly excluded.

In the event of a claim, proof of purchase must be provided. In the event of a dispute, the determination of the manufacturer or recognised industry association is the sole basis on which replacement or refund is made.

This limited warranty shall under no circumstances override legal guarantees that may be required under the Consumer Act. The warranty is not transferrable and applies only to the original purchaser.

APPENDIX D4: Achilles Flexible Clear PVC

The Nolan Group warrants that the Achilles Flexible Clear PVC products specifically designed to be used for Outdoor Blinds and are guaranteed to be supplied free of defects.

'Free of Defects' means that the products meet their published descriptions and technical specifications, and are homogeneous in appearance after allowance for minor variance that is inherently the result of the manufacturing process.

The Nolan Group further warrants that the products will perform satisfactorily when used in its design context in the temperate climatic conditions experienced throughout Australia.

'Satisfactorily' means with continued but gradually diminished utility over its expected life, due to the unavoidable effects of ultraviolet radiation and weathering, such as colour variation, strength loss, and dimensional change. Extreme climatic conditions, particularly high temperature and humidity, may accelerate this inevitable product degradation.

'Expected Life' is at least the period covered by warranty, provided the products are installed properly, and cleaned and maintained as recommended.

The warranty specifically excludes imperfections such as creasing, folds, etc. caused by handling during fabrication of the blind or its installation or its operation; mechanical fatigue due to wind load, and damage attributable to faulty design or installation, such as abrasion by componentry; or tear caused by undue concentration of stress at supports; to storm or cyclone events, including hail loading; and to vandalism.

The warranty period is TWO YEARS for ROLLCLEAR and ROLLGLASS; and THREE YEARS for ROLLGLASS PLUS.

The liability of the Nolan Group is limited under this warranty to replacement of material only, or refund of the original invoice price, both options with a discount on value for the time the fabric has been in place, on a pro-rata basis as follows:-

The first half of the warranty period	**Nil Discount**
The third quarter of the warranty period	**50% Discount**
The final quarter of the warranty period	**75% Discount**

Liability for negligence (e.g. careless operation, inappropriate cleaning procedures), or for any consequential loss, including labour and installation, is expressly excluded.

In the event of a claim, proof of purchase must be provided. In the event of a dispute, the determination of the manufacturer or recognised industry association is the sole basis on which replacement or refund is made.

This limited warranty shall under no circumstances override legal guarantees that may be required under the Consumer Act. The warranty is not transferrable and applies only to the original purchaser.

The Nolan Group Product Warranty is independently supported by that of our Supplier:

Achilles Corporation

Shinjuku Front Tower,2-21-1, Kita-Shinjuku, Shinjuku-ku, Tokyo 169-8885

www.achilles.jp/english

Nolan Group

Blind & Awning Division

SYDNEY
3 Bradford Street, Alexandria

NEWCASTLE
16 Ironbark Close, Warabrook

BRISBANE
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