

About Fabric Structures

Attributes of modern fabric structures

2013

About Fabric Structures

Introduction

One of the priorities recognised by the Fabric Structures Committee of the Specialised Textiles Association of Australia is the need for an independent and unbiased information source available to promote our growing industry to government, policy makers and the public, that is, anyone about to make a decision on whether to purchase a fabric structure.

The background for this report came from a meeting held with NSW Department of Education in 2010 where this industry was asked to provide a promotional document to give to school principals to promote fabric structure products for schools. There was no independently available document.

Fabric structures have arisen from a demand for flexible and cost effective shade options which will work and protect in our hot climate. The industry is growing in size and value in line with advances in materials and processes. New applications emerge daily for the use of fabric structures. Often fabric structures are replacing and becoming the first option over traditional building products. Beauty, price and practicality are some of the many reasons for this change.

On the other side, our industry will inevitably be questioned and criticised. Are fabric structures safe, installed correctly, designed to the highest building standards, of good quality and so on. While each shade contractor can answer these questions to promote their own products, the Specialised Textiles Association, through this report, can now offer an independent response.

To foster understanding and encourage industry growth it is important to assess the benefits of fabric structures by identifying

- the attributes of fabric shade structures
- building and design parameters
- industry standards and regulations and
- positive comparisons against other materials.

Members of the Fabric Structures Committee of the STA have identified fifteen key areas which define fabric structures and address issues of significance. Their collective input, grounded on many years of experience, in the form of comments and research have been used to produce this positive and useable resource. This report is the first version of "About Fabric Structures".

Beatrice Moonen.
Chair, Fabric Structures Committee of the STA

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1. Weather Protection

Sun Protection

Shade provision is the basis of our industry. Australia has the highest incidence of skin cancer in the world but we all enjoy spending time in the great outdoors. Finding a healthy balance is the role of a fabric structure designer and installer. Fabric structures provide aesthetics, weather protection and comfort. Fabric structures are a highly effective method of maximising health benefits when outdoors because they reduce the immediate exposure to the sun and the often not so immediate danger of long term sun exposure.

UVR Block

UVR Block is the percentage of Ultra Violet radiation, (i.e. wavelengths in the 290- 400nm range), that is blocked by the fabric. This is the combination of the UVA (315-400nm) and the UVB (290-315nm) spectra. Both UVA and UVB can cause damage to the skin and increase the chance of skin cancers and melanoma. UVA rays are responsible for ageing, they are less likely to cause sunburn but do cause wrinkling and leathering of the skin. UVB rays are more potent than UVA in causing sunburn, therefore these rays are considered the main cause of skin cancers.¹

Testing Methods

1. Design of the structure will impact on shade and weather protection. Angles, stretch, adjoining buildings or trees, shade projection and seasonally variability all impact on shade levels provided by a structure
2. Uniformity of testing methods is required to allow users to select most suitable fabrics. eg results in tensioned or untensioned state can give widely different results.
3. Tests results available today are based on UVR on sun protection levels for worn clothing not shade structures. There are plans to open testing standards specifically oriented towards fabric structures.
4. Knowing the UVR properties of shade cloths is one component of obtaining the most effective shade solution. In the past The NSW Cancer council recommended a UVR block of 94% or greater for schools and public places but in 2013 is supportive of a review of shade cloth standards for test for other relevant factors as mentioned.

General weather protection

Protecting people from the sun is the most important function of a fabric shade structure. In addition to protecting people there are many other applications where fabric structures offer weather protection;

- Shading vehicles and car parks
- Keeping swimming pools cool in summer
- Reducing the need for chemicals to be used in swimming pools
- Preventing leaves and other falling debris
- Covering machinery and keeping it cool and or dry
- Better utilisation of outdoor work areas or as
- Weather protection alternatives to more expensive bricks, steel or glass buildings.



2. Costs



Fabric structures offer many cost advantages:

- Low material costs
- Less materials required to cover a given space – typically traditional roofing materials require more support structures such as trusses, battens etc. to fix the roofing sheets.
- Shade structures typically require much shorter installation times requiring less labour and materials
- Lower replacement costs – the cost to replace a fabric roof at the end of its life is often less than other roofing materials
- Energy savings
 - Installation of shade structures typically uses less plant and equipment thereby reducing energy required
 - Shadecloth Sails reduce temperatures under shaded spaces by as much as 10 degrees reducing the need for electrical fans and air conditioners.

3. Fabrics Available

Shade cloth fabric

The most commonly used Shade cloth fabric is a knitted **HDPE** (*High Density Polyethylene*) material. The fabric is an open weave, porous material that provides 80-97% UV A & B (ultraviolet suns rays) blockage. The porous nature of the fabric allows heat to escape lowering the overall temperature under the fabric by some 10-30 degrees. This material is the least expensive of the tensile membrane structure fabrics. It is lightweight within the range of 190 to 500 gsm. A FR shadecloth fabric has been developed which is flame resistance. This means the fabric is self extinguishing and will not propagate flame.

Shade cloth fabric is not waterproof, it will block out a small percentage of rain. Shade cloth fabric is constructed by 2 distinct methods, (1.) a HDPE tape knitted together with a HDPE monofilament, or (2.) a complete monofilament construction. Shade Cloth fabrics have about a +15 year life span and come with up to a 15 year pro rated warranty against degradation from UV exposure.

Shade Cloth fabric canopies are assembled from shade fabric roll goods which are cut into shaped panels and sewn together using poly-cotton blend or long life Tenera® (Teflon) thread. Corner and other high stress areas of the canopies are reinforced with an additional layer of fabric or heavier PVC binding and webbing.

Waterproof PVC fabric

PVC fabric is the most popular material used in waterproof structures. The fabric is a composite of a woven polyester yarn coated on both sides with PVC (*Poly Vinyl Chloride*). The PVC provides a protective weather barrier surrounding the polyester yarns. Plasticizers are added to the PVC to give the fabric its flexibility providing an ease in handling, fabrication and installation. There are a variety of manufacturers of structural grade PVC fabrics in the world and each typically offers 5 to 6 grades of material. Typically when looking at different PVC fabrics the weight of the fabric is considered, with fabrics ranging from 400gsm to 1500 gsm. The most important design criteria when selecting a specific grade of PVC fabric is **Tensile Strength** and **Tear Strength**. Each grade offers a different level of tensile strength.

Tensile strength ranges from 248/225 daN/5cm to 1000/800 daN/5cm. Tear strength ranges from 16/11 daN to 160/140 daN.

Additional top coats are applied to the fabric to help keep the material clean. These include Acrylic & PVDF (polyvinyl-idene-fluoride). While the top coating improves the serviceability of the fabrics, periodic cleanings may still be required for some fabrics.

PVC fabric canopies are assembled from roll goods cut into shaped panels and welded together (lap seams) using RF (Radio Frequency) welding that forms a bond equivalent to the strength of the fabric. Corners and all high stress areas are reinforced with an additional layer of material bonded in the same fashion as the seams. Repairs that may be needed in the field are accomplished by adhesive bonding a patch over the affected area.

PVC fabrics typically have a 10-15 year service life though some structures have been known to last in excess of 20 years without ill effect. PVC fabrics have a 5, 7, 10, 12 or 15 year pro-rated warranty. Some colours are available, though predominantly, a white or cream colour is used to maximize the heat reflectivity (85%) and allow for up to 20% light transmission through the fabric. Each individual PVC fabric will have a flame retardancy test certificate which documents spread of flame and smoke produced.

PTFE fabric

PTFE (Poly Tetra Fluoro Ethylene) fabrics are the top of the line choice for permanent fabric structures due to their longevity, self cleaning attributes and non-combustible nature. The first structure to incorporate a PTFE roof is the Activity Center at LaVerne College in California installed in 1973 and still in use today. The fabric is produced from high strength woven fiberglass yarn bonded with up to seven layers of PTFE coatings. The PTFE fabric is available with a 15 year warranty and has a life expectancy of 30+years. PTFE is an inert chemical which provides its self cleaning capability, the same chemical that is used in most non-stick frying pans

As with the PVC the PTFE fabrics come in a number of tensile grades allowing for a large variation in designs. Typical weight range for the fabric is 640 gsm to 1600gsm. The most important design criteria when selecting a specific grade of PTFE fabric is **Tensile Strength** and **Tear Strength**. Each grade offers a different level of tensile strength.

Tensile strength ranges from 400/350 daN/5cm to 875/831 daN/5cm. Tear strength ranges from 18/18 daN to 71/80 daN.

Fabric panels are assembled with overlap seams, similar to the PVC except in this case high heat and pressure are used in combination with an FEP bonding tape. Field repairs are made in a similar fashion with hand held units.

This is the only structural fabric that is classified Non-Combustible per ASTM E136. This is a material you could apply a propane torch to and only achieve a slight discoloration. Due to its non-combustible nature it is the only material that most building jurisdictions will allow as the roof or skylight of a building, or as a roofing material spanning between two structures or in any case where the Fire Marshall or building official might deem a potential fire risk to other structures.



4. Sustainability

The awareness of the benefits of passive cooling and sun protection together with the development of advanced synthetic textiles led to the emergence of the fabric structure industry in the late 1980's. This industry plays an active role in reducing reliance on energy and caring for the environment through sustainable practises.

Sitting under a light weight structure is preferable to sitting under a brick, metal or glass building for many reasons.

- Fabric s used in fabric structures are lighter and require less raw materials in their manufacturing process and consequently less energy consumption
- Passive energy benefits by providing outdoor cooling as an alternative to cooling by indoor air conditioners,
- Additional passive energy benefits from fabrics having natural lighting properties and translucencies which reduce reliance on artificial lighting and
- Consumer cost savings from initial lower prices and long term zero operating costs.

Sustainability in design

1. **Water Harvesting.** PVC waterproof structures often have surfaces large enough to collect water. In the same way water is collected from a solid roof so too water tanks can be fitted adjacent to a waterproof fabric structure. Gutters, drain pipes and water tanks can be designed and installed onto the structure by fabric structure installers. A licensed plumber can then connect the downpipes to a water tank. Tanks to 10,000litres may be exempt from council approval. (see your local council)
2. **Cleaning.** Cleaning structures regularly to remove surface dust and sediment not only keeps the structure fresh and new it protects it and makes it more efficient. A clean structure allows water to penetrate through the woven fabrics rather than being trapped within the dirt and risk overloading or failure of the structure.
3. **Life Spans of fabrics.** Fabrics used in shade structures today have long life spans of commonly lasting ten years before replacement. Plastics manufacturers are innovative and some plastics such as Teflon glass used in structures today have life spans of 50 years.
4. **Designing to maximise shade.** Attention to the placement of structures in relation to seasonal sun direction and time of day can provide passive cooling benefits and offer maximum shade when needed. Shadow diagrams ensure that shading is available where needed.

Locating structures adjacent to building will minimise heat and glare in building and can reduce reliance on air conditioners.

Sustainability in the workplace

1. Reducing Wastage
 - a. PVC off cuts can be made into small items e.g. product bags, bunting,
 - b. Software available places fabric for cutting into the most economical layout ie nesting
 - c. Short length steel posts can be welded together unobtrusively and without losing strength or aesthetics.
2. General measures
 - a. Transport – new vehicles, well maintained vehicles, alternate clean fuels and using freight companies for deliveries,

- b. Reduce reliance on air conditioners by installing opening windows in offices
 - c. Duplex paper copying, paper and print cartridge recycling,
 - d. Energy efficient lighting,
 - e. Recycling water with the installation of water tanks and
 - f. Saving electricity reliance by installing solar panels into big factory rooves.
3. Suppliers
- a. Some suppliers are offering recycling for off cuts of shade cloth, PVC's and polymer fabrics,
 - b. Coatings on fabric with minimal ozone interference due to the use of water based coatings.

Response from manufacturers of synthetic fabrics.

Often but not exclusively these raw materials manufacturers are the giants of this industry making the shade cloths and the PVC's i.e. the raw materials. They may employ thousands of people, operate on a global scale, have vast market capitalisation levels but they are also very aware of their responsibility to care for the environment. How environmental considerations are successfully integrated into the manufacture of plastics, once considered a non recyclable, non sustainable industry is quite a phenomenon. Two decades ago the idea of plastics recycling did not exist. Advances in sustainability are being accomplished today through the introduction of;

- a) In-house recycling and external recycling systems²
- b) Water based coatings on fabric to minimise co2 ozone interference and reduce reliance on traditional chemicals.³
- c) Sustainable production practices e.g. re-using waste base products such as pastes
- d) Euro PVC manufacturers are committed to sustainable production through "Vinyl 2010" and "Vinyl Plus" itself regulating initiatives have led to recycling of 250,000 tonnes of PVC annually
- e) Recycling to reduce gas emissions and transport
- f) Purification of waste gases to reduce co2 emissions
- g) Recirculating and reusing thermal energy to reduce consumption of gas and electricity.



² Mehler Technologies, Germany - Strong sustainable future Eco-Care policy.

³ Wax Converters- Leading Australian Manufacturer.

5. Fabric properties

Design parameters.

Thin low mass skin, Require initial tension in fabric, Curvature necessary to resist loads, Deformation under load to be taken into account, Pre- tensioned forms must be established.

Flexibility

Styles of membrane form, Hypar, Conic, Saddle, Ridge and Valley, Unique shapes, Freedom of creation, Signature to put site on the map, Strong identification, Flexible skin, dismountable, relocatable, deployable, Rapid onsite installation large clear spans

Combine with different materials, metal , glass, wood , concrete, bamboo

Graphic customisation ink jet printing, silk screening, air brush, *Graphic projection*

Heat transference of fabrics

Temperate reduction underneath the canopy of 10 to 35 degrees

Light & Translucency

Opaque fabric are available (Block out) fabric to 50% translucency through the whole roof surface, Natural light is favourable to performance in working environment, Well distributed natural light is a safety factor in working environment

Long life of fabrics

Resistance to a wide spectrum of climatic conditions even under extreme environments, polar, tropical, sea front, high sun exposure, desert, & mountains

Suitable for residential, hotels & restaurants, car parks, schools, child care, commercial sites, stages & recreational park facilities, sports facilities

Recycling by Taxyloop process.

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6. Vandalism

General

When shade sails in public spaces are designed following a few rules vandalism and the cost of vandalism can be reduced.

Vandals of fabric structures are generally juveniles looking for mischief and not hard criminals. The outcome can be very costly. They care little about the damage they do nor the risks to their own health and safety .

Well planned fabric structures can be less of a target. There are numerous examples of sails in public areas which are strong and vandal free for many years.

Design Measures

The following design measures have been tested in public spaces and do work to deter vandals from shade sails;

- Shade sail posts located at least 1.5m from climbing aides such as playground equipment, fences and walls. Without climbing aides vandals cannot climb.
- It is also important to ensure the sails themselves are not reachable from playground equipment, fences and walls. Many sails are accessed by climbing on the roofs of play equipment and then reaching up to the edge of the sail and climbing up.
- Locate structures away from other structures which would allow access on to the surface of the sails such as adjacent building roof surfaces. Many shade structures are accessed by climbing onto existing building roofs and then jumping across onto the shade structure.
- Include anti climbing plates/prongs on the tops of posts as visual deterrents.
- Use of wider diameter posts which are near impossible to grip and climb. Posts over 250mm OD are hard to climb.
- Use of taller posts which are deter climbers and/or
- Lock gates and fence off public areas after hours eg schools, parks.

Installers and Consumers

Shades in playgrounds, parks and schools allow people to enjoy the great outdoors comfortably and safely. In the last twenty years shade sails have become an integral part of Australia's outdoor landscape. Vandalism unfortunately is all around us and shade structures do get targeted from time to time. We need to be one step ahead of vandals.

Shade installers and consumers need to consider adopting anti vandal measures in the design of shade sails in public areas.

7. Installation

Installation of fabric structures including the fabric sails, posts and fixings needs to be planned.

The most important considerations for an installer are safety and design.

SAFETY

A Sample Safe Work Method Statement follows which identifies some site risks. Each site is unique and presents its own set of risks to be managed by the installer.

Underground searches

If installing posts location of underground services such as power, gas, water and fibre optic cables needs to be considered. For locations in public spaces “Dial before you Dig” should be consulted. NSW is the first state where it’s now a legal requirement to contact “Dial before you Dig” for all underground work on private property and work for public authorities.

If there is any doubt or risk when excavating, hydro vac systems should be considered.

Most excavation sub contractors have an “All care but no responsibility” clause when location of underground services is unknown.

Working at heights

Sail installation normally involves working at heights. The contractor needs to assess the safety of the site and determine if the use of scaffold, scissor lifts are required or whether the project can be safely installed using a ladder.

Tension and water flow

Fabric structures need to be tensioned correctly. Both shade cloth sails but even more so waterproof sails need to make allowance for adequate water runoff to avoid ponding and risk of collapse during a rain event.

Guidelines for installing structures

Refer to document “Guidelines for Installing Shade Structures” for further details.

Sample: Safe Work Method Statement (Risk Assessment)

Job steps	Hazards	Risk level	Controls
GENERAL			
Check PPE is in working order prior to arrival	PPE is the last barrier of protection. Injuries are possible without it.	1	All safety equipment to be inspected prior to use and replaced if showing signs of wear and tear. Abacus to Make available to staff all PPE required to get the job done safely. All workers to be trained in the proper use of PPE.
Arrive on site and attend induction	Assess safety of site	1	Report any matters to site co-ordinator/principal
Working in the Sun	Dehydration and/or heat stroke	3	Drink fluids, utilise shade, hats, sunscreen and protective clothing.
Unmarked work site	Cause injury to employees or members of the public.	1	Apply bunting around work area. This acts as a deterrent for members of the public to wander into work area.
FOOTINGS			
Digging Holes-hand dig	Jarring to wrists, hurting back	3	Training in house/experience
Digging Holes-using machinery or hand digging	Hit underground services	2	Client and/or site head contractor to advise of underground services. They may provide Dial Before U Dig results, site plans showing underground services and/or have a pipe and cable search done.
POWER TOOLS			
Extension Cables	Tripping over	3	Find closest power outlets. Use minimal cable. Avoid placing cable near walkways. Keep someone on watch if near walk area.
Working with power tools	Wet weather electrocution	1	Do not use electric tools in the rain. All tools inspected & tagged.
Working with Drills & Rattle Guns	Electrocution	1	Prior to starting drill keep power cords away from drill bit
	Wrist sprains	2	Keep a firm grip on the tool, use two hands for deeper holes
SAIL INSTALLATION			
Installing Sail	High wind lashes sail which could hit or throw worker eg from ladders	2	Do not put up sails in windy conditions. Tie down sail with rope to stop sail moving in the wind.
Installing Sail	Wet weather – electrocution, slippery conditions	1	Do not install sail in wet weather.
Working from ladders	Falling from ladder	1	Stabilise ladder, have someone at base.

8. Design Options

Fabric structures offer many design options offering a range of solutions and advantages to suit different applications:

- **Sails** – free form fabric membranes often referred to as tension (or tensile) membranes which describes the method used to support these structures. Sails provide for an almost unrestricted design providing a simple means to cover irregular spaces. An essential characteristic of sails is their requirement to be a 3 dimensional form allowing the sail to change shape when subjected to loads. Single plane fabric forms such as sloping sails and triangles can only stretch when loaded leading to increased wear and reduced product life.
- **Shade Structures** – refer to structures where the fabric is supported on a frame. Examples of these include hip shaped structures (often seen in school yards), market umbrellas, and gazebos. Often these structures are available in a range of modular standard shapes and sizes. These structures offer many features
 - Typically Lower cost than tensile structures
 - Often require smaller footings than tensile structures
 - Ideally suited to covering play equipment or other projects requiring high clearance in the middle and Lower heights all-round the perimeter to maximize shade performance
- **Custom Structures** – describe a wide range of fabric solutions which are built to suit a specific site, location or purpose. Often these structures are attached to, overlap, or are built to avoid existing structures. There are many examples of this kind of structure such as walkways, entrances, porte-cocheres etc. These structures are typically chosen over traditional alternatives for architectural reasons such as natural light transmission, aesthetics, and iconic form.

9. Engineering

Shade sails and tensile membrane structure are flexible dynamic structures which react to the elements especially wind and rain.

During the design process a number of important design rules have to be complied with as well as state and national codes as follows;

Codes and standards

AS1170.0&2-2011 Structural design actions- general principles and wind loading codes

AS2870 Residential slabs and footings

AS4100 Steel structures code

Building Code of Australia (BCA)

Site specific requirements

Full property description for council approval documents

Importance level, Wind Probability, Wind Region, Wind Direction Multiplier (M_d), Terrain/Height Multiplier ($M_{z,cat}$), Shielding Multiplier (M_s), Topography Multiplier (M_t), Hill-shape Multiplier (M_h)

Soil type -- sand, stable, clay, reactive, rock, waterlogged, tree roots, contaminated

Class 'A' - Little or no ground movement

Class 'S' - Slightly reactive sites

Class 'M' - Moderately reactive sites

Class 'H' - Highly reactive sites

Class 'E' – Extremely reactive sites

Class 'P' – Problem site

Site specific Geotechnical investigation

Contact dial before you dig for underground services information

Set back requirements, -- front boundary, side boundary, rear boundary, easement, sewer line.

Water table

Local government documentation

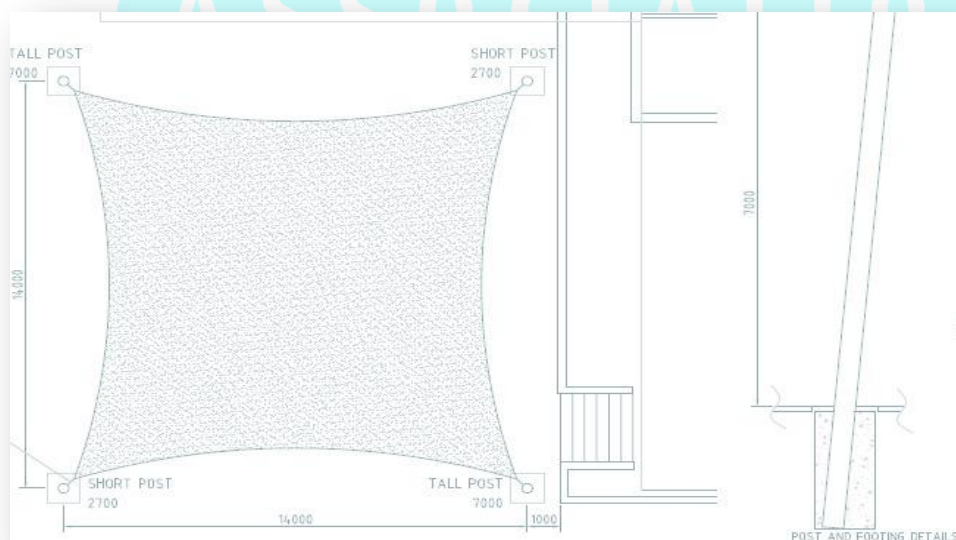
The design of shade structures shall be depicted on scale drawings which include the following:-

- a) Sufficient detail to fully described the structure
- b) Proposed location and site address of structure
- c) Plan view and two elevations
- d) Details of connections
- e) Details of footings
- f) Size of all structural elements
- g) Grades of materials shall be specified
- h) Designers name and details
- i) Drawing number, drafters name and date
- j) Revisions shall be clearly shown, numbered and dated
- k) Reference the design drawings by number and revision
- l) Indicate the loadings used
- m) Indicate soil properties adopted and whether assumed or by test
- n) Design standards governing the design
- o) Site address or relevant wind category
- p) Certifying engineers credentials and relevant professional registration

Lodgement of documentation to local government

Lodge documents with relevant council building department or with private certifier for building approval.

Dependent upon region, the local council may require proof of payment of building project insurance, or building industry superannuation contributions



10. Legislation

Some of the main areas of national legislation regulating the fabric structure industry are as follows;

Building Act (1993)

- To regulate building work and building standards;
- To provide for the accreditation of building products, construction methods, building components and building systems,
- To regulate building practitioners.

Building Codes of Australia

Provide a uniform set of technical provisions for the design and construction of buildings and other structures throughout Australia.

Building & Construction Industry Payments Act (2009)

Ensures that all parties in the contractual chain are given sufficient protection to receive payment for work undertaken

National Code of Practice for the Construction Industry

The National Code of Practice for the Construction Industry guides the standard of practice for building and construction work for Government-funded projects. The code describes what represents good practice in workplace relations, occupational health and safety, procurement and security of payment in the construction industry.

Fair Work Act (2009) and Fair Work Regulations

Ensure there is a balanced framework for cooperative and productive workplace relations;

Fair Work (Building Industry) Act (2012)

The object of this Act is to provide a balanced framework for cooperative, productive and harmonious workplace relations in the building industry

National Employment Standards

Sets minimum standards that apply to the employment of employees.

Work Health & Safety State Acts

To provide for a balanced and nationally consistent framework to secure the health and safety of workers and workplaces

Workplace Gender Equality Act (2012)

Gender equality in the workplace for both men and women

Australian Standards

The nation's peak non-government Standards organisation. It is charged by the Commonwealth Government to meet Australia's need for contemporary, internationally aligned Standards and related services.

Planning and Environment and Sustainable Planning (State) Acts

Set out the framework for planning the use, development and protection of land.

11. Installer licensing

Each state differs in what it considers to be the basic skill and training requirements to install a fabric structures and to deal with the public. Not all states require licensing, some states issue licences based on experience or financial position and still other states have minimum educational qualifications in order to obtain a licence to practice.

Refer to document "State Licensing Requirements"

National Licensing proposal.

The Federal government has stated it is committed to "a seamless national economy with one set of rules, to ease red tape and make for good government". Part of this involves a national licensing of occupations. National license planning is underway for the electrical, plumbing gas fitters trades and is expected to commence in 2014. The construction industry, which includes our industry, will follow thereafter.

The STA through the Fabric Structures Committee is well aware of the glaring discrepancies in state by state licensing and supports reform. The National Occupation Licensing Authority is responsible for this complex and time consuming reform.

The benefits of national licensing include;

- that a company can tender for work anywhere in Australia,
- removal of discrepancies between states,
- increased state by state competition,
- increase productivity and
- The ability of licensed employees to move around Australia for work.

12. Training Courses

Below are some basic training courses related to the fabrication and installation of fabric structures which can streamline the process of obtaining licenses to practise where required but useful skills in the manufacture and installation of fabric structures. These courses are recommended by regulatory authorities in each state.

In addition to these training courses proven experience and skill competencies may be recognised to obtain licensing.

NSW

TAFE course Certificate II in Blinds and Awnings (Shade sails) or Certificate I Construction with additional units as specified.

QLD

- An apprenticeship in Textile Fabrication or Carpentry or
- Certificate 111 in Textile Fabrication LMT30407 or
- Certificate 111 in Carpentry CPC30208
- Equivalent course

or

Certificate as a qualified canvas and sail maker tradesperson or a qualified carpentry tradesperson plus competencies from Certificate IV in Building and Construction (Building) CPC40110 or equivalent competencies.

WA

A Diploma of Building & Construction and five years experience for larger structures.

VIC

None specified.

A Domestic Builder is issued with a certificate by the board after being examined to show adequate knowledge and experience.

Tasmania

None identified. Accreditation is available without Certification for shade structures; if that is the work undertaken and references can be obtained to attest to building skills.

NT

None identified

ACT

None identified. 3 years building experience

South Australia

Certificate IV in Building SA or Cert IV in Small Business Management

13. Industry Accreditation

The Specialised Textiles Association of Australia is committed to accreditation. The STA has a strategy to achieve this end and will be looking at launching a pilot program in late 2013.

Accreditation is about attaining levels of membership within STA based on meeting skills and experience criteria. There is opportunity to extend this reform to handling of disputes within the industry to avoid expensive legal options.

It will also be a means for the public to identify varying recognition levels within the Specialised Textiles Association.

14. Maintenance

Shade sails and waterproof structures are light weight constructions using fabrics with a specified life spans. Their Low cost, flexibility and aesthetics make them popular. This being the case they do need to be inspected and maintained from time to time to keep them looking their best and functional.

Inspections

Will ensure the structure is sound, maximises its lifespan and can find areas needing maintenance. Inspections ensure that small problems don't become big problems. Mitigation of loss and or damage occurs by attending to maintenance early. It is advisable that owners inspect their structures from time to time or that a maintenance agreement is entered into with the installer. This is particularly important after a major weather event where excessive loads can cause wear or damage.

General Maintenance Issues

Shade sail maintenance can be low cost and a straight forward process. A few suggestions follow.

Fabrics

- Wash shade cloth with soft brush and gentle cleansers to remove built up dirt and mould. Mould may be present on shade cloth if there is moisture and plant material about. This is more than an aesthetics issue. Allows water to move freely through the weave avoiding water being trapped if the fall on the sail is slight.
- Stretching of some fabric in may require re-tensioning of the sail after one year.
- Tears or perished stitching need to be repaired.
- A pulled down shade sail can be washed and re-tensioned if needed. This minor work can make the sail look new again.
- The fabric may have reached its lifespan warranty period. If so replacement is a straightforward option. Fabrics can be replaced and the structure refreshed for a fraction of buying a new fabric sail structure.

Steel

- Surface rust while not effecting the strength of the steel, may look unsightly. This can be removed with a stiff brush and a coat of paint.
- Chips on painted surfaces can be touched up with rust inhibitor and paint.
- Loose fittings need to be re tightened or new ones purchased. Stainless Steel fittings are inexpensive to replace.
- If in doubt about bending, rusting or damage to steel members call an expert to make an assessment.

Major maintenance and insurance issues

While many fabric structures will never require maintenance, events outside the control of the installer or the capacity of the product do happen. Extreme weather, vandalism or vehicle damage as examples, can cause damage to a shade structure. In this situation there are procedures to follow.

Lashing fabric should be secured if possible and the area cordoned off to minimise risk of injury to persons or damage to property.

The installer should be contacted urgently to inspect, assess and act.

It is advisable that shade sails or structures be insured. Most insurance agencies offer shade structure coverage as part of business or household insurance policy. Check that your shade structure is insured on your policy.

15. Further technical considerations

Shade sails and tensile membrane structures are flexible dynamic structures which react to the elements especially wind and rain.

Play ground equipment

Fall zone requirements for each piece of play equipment must be considered when designing a shade product for a play area.

Adequate height clearance is required from the highest element of the play equipment to the shade canopy

Fabric type

The canopies of shade structures, shade sails, and tensile membrane structures are manufactured from a range of materials, each of which has unique properties.

- a) Shade cloth HDPE
- b) PVC Fabric
- c) PTFE fabric

The selection of fabric is determined by the client requirements for the built shade product.

Foundation type

A pier foundation is the most efficient economical type of foundation for a shade product. A pier foundation utilises the skin friction and reaction to surrounding soil to offer uplift and overturning resistance against wind loading.

A pad foundation utilises mass of concrete to offer uplift resistance against wind loading. A pad foundation will be used in situations of sandy unstable soil types or where the depth of a pier foundation is not achievable.

Design wind speed

Exact site details for determining design wind criteria for a project is vitally important. The following table highlights the dramatic increase in wind pressure acting on a structure in relation to the increase in wind speed.

Site wind speed Km/hr	Site wind speed m/s	Pressure acting on structure
36 km/hr	10m/s	0.060 kPa
54 km/hr	15 m/s	0.135 kPa
72 km/hr	20 m/s	0.240 kPa
90 km/hr	25 m/s	0.375 kPa
108 km/hr	30 m/s	0.540 kPa
126 km/hr	35 m/s	0.735 kPa
144 km/hr	40 m/s	0.960 kPa
162 km/hr	45 m/s	1.215 kPa
180 km/hr	50 m/s	1.500 kPa
198 km/hr	55 m/s	1.815 kPa
216 km/hr	60 m/s	2.160 kPa
234 km/hr	65 m/s	2.535 kPa
252 km/hr	70 m/s	2.940 kPa

Type of structural supports

The structural components of the shade project can be manufactured from a range of materials.

- a) Aluminium
- b) Steel
- c) Stainless steel
- d) Hardwood timber

Protective coating of structural supports

The structural steel work of a shade project requires protection from the elements. The level of protection is determined by the location of the project and its proximity to corrosive environments. Each coating company has a different level of warranty for their respective coating system.

- a) Pre galvanised coating on steel work
- b) Powdercoating
- c) Hot dip galvanise
- d) Hot dip galvanise and powdercoat
- e) Triplex powdercoating system
- f) 2 pack paint coat system

Selection of a coating system is quite often determined by cost.

Fixings

The fixing components of a shade project can be manufactured for galvanised steel or stainless steel Gr 304 or Gr 316. It is important to note that stainless steel is prone to tea staining and the client need to be made aware that the stainless steel fixing requires regular maintenance and cleaning to ensure optimum aesthetic appeal.

Catenary edge of a shade sail

The catenary edge of a shade fabric sail may be manufacture by either of 2 procedures.

- a) Cable in pocket
- b) Webbing sewn to perimeter

The manufacturing procedure utilised will be determined by size of shade fabric sail and supply price of shade fabric sail.

16. Comparisons with other building materials

Fabric structures have established their place as an option to traditional building materials. At the top of their advantages come price, design flexibility, aesthetics and lightweight materials.

FABRIC STRUCTURES V's OTHER BUILDING PRODUCTS

	Shade cloth sail	PVC structure	Steel sheet roof structure	Brick & Tile Building	Glass Atrium
Warranty	To 15 years	To 15 years			
Initial Cost	\$ Low	\$ Low	\$ Med	\$\$\$ High	\$\$\$ High
Maintenance costs	\$ Low	\$ Low	\$ Low	\$ Low	\$ Med
Sun reflection	Med-high	High	High	Med-High	Low
Design Options	High	High	Low	Medium	Low
Sun protection	Good	Excellent	Excellent	Yes	Low
Reflected Heat	High	High	Low	High	Low
Vandalism	Good	Good	Good	Good	Good
Acoustics	Excellent	Excellent	Poor	Good	Poor
Insurability	Yes	Yes	Yes	Yes	Yes
Aesthetics	V High	V High	Low	Med	High
Colours	Yes	Yes	Limited	No	Limited
Practicality	V High	V High	Limited	High	Medium
Insurable	Yes	Yes	Yes	Yes	Yes
Ease of replacement	High	High	Med	Low	Med

Material weight	Light	Light	Medium	Heavy	Medium
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17. An end note – Is the price too good to be true?

While fabric structures compete very well on price over traditional building materials, it is important to know that the price is a fair and reasonable price when comparing between other fabric structures. As a consumer, if the price seems too good to be true, ask questions. This report has identified that a fabric structure should follow certain criteria in order to guarantee a quality result which will provide many years of satisfaction.

While we all want value for money the user must ultimately decide if a cheap price comes with risks. Choosing by price alone may become more costly than the savings to be had. The consumer must be aware of shortcuts. Here are a few to look for;

Don't need Council approvals or permits

The arguments:

- Approvals and permits cost time and money so why bother.
- I can get away without one.
- I have good neighbours and they won't "dob" me in.

The truth

- It's OK until there's a problem. When substandard work fails there may be serious consequences to people or property.
- Councils employ engineers to review that the fabric shade structure is safe and built to building standards.
- Obtaining approval means you won't risk being told to pull it down. Shade structures without approvals have been ordered to be pulled down.
- You can sell your property smoothly knowing building certificates are in order.
- You won't risk insurance claims being rejected because the structure was not approved.
- Peace of mind to enjoy a quality shade structure.

It's only a shade sail, how hard can it be?

A skilled installer should act upon their own judgement, offer sound guidance and not accept short cuts or direction from clients no matter how well meaning. Taking guidance from a client does not absolve the builder from their responsibility to do the job correctly. "Just attach it here, the wall is strong enough" or "The cement is thick enough to support a pole" is not good enough.

Another serious short cut is to not check for underground services. The property owner is usually responsible if cables and services are hit on their property. In NSW however the builder is required to check for major assets eg gas or electricity. Penalties for hitting services can be significant. Risks to workers can be greater. So don't skip this step.

Are materials used in the job adequate? This can be checked by comparing quotes and ensuring that what is being used on the job is what was specified and preferably by an engineer. An underspecified post is less expensive than the right post but will the structure be sound over time or could it fail? Make comparisons.

Who needs a licensed or highly skilled installer.

The arguments:

- You don't have to use a licensed operator
- The installer seems to know what they're doing and they aren't licensed.
- Licensed operators charge more.

The Truth:

- If you find yourself in court the first question asked may be "Was the operator licensed?" The penalties and risks are higher for both parties if the answer is no.
- In some states licences are required. If this is the law it is there to protect consumers. If licenses aren't needed in your state, determine the installer's skill and experience levels.
- Skilled operators get licenses readily. Experience and skills are recognised in licence training courses or when applying for licenses.
- In states where its law, a licensed operator who has met all the criteria for obtaining a licence is more likely to offer quality work of high standard.
- More and more often consumers want to know that tradespeople are licensed.

Information - Protecting the consumer

- Consumers want information to weigh up the options and make the right decision.
- A tradesman that knows their product and the rules is respected.
- Some questions you need to ask of the installer/contractor:
 - Are they insured?
 - Are they licensed?
 - Is council approval or permit needed?
 - Is a contract and a written quote provided.
 - Are you getting the same components and product from each contractor?
 - Does the shade structure give you the shade you want?

In the long run choosing by price alone may become more costly than the savings. If you have asked the right questions and the job remains well priced congratulations you have a bargain.

The Specialised Textiles Association has an easy to use Consumer Checklist available to the public to help select the right installer. A copy of the Consumer Checklist follows.

Checklist for selecting a shade structure installer

Consumers This checklist will assist you to select a shade structure installer who works according to standards, regulations and best industry practise. For further information please visit www.specialisedtextiles.com.au

Installers Pre complete and give a copy of this checklist to clients when quoting.

	Quote 1	Quote 2	Quote 3
Name of the shade structure installer quoting.			
THE INSTALLER			
1. Is the installer licenced? What is their Licence number? Complete a licence check.			
2. Does the installer have a track record of similar jobs? Ask for addresses of previous jobs, references and years in business.			
3. What percentage of the work does the contractor do directly and what is done by others. To help assess level of expertise and after sales service.			
THE CONTRACT			
4. Do you have a written quote and does it include GST?			
5. Do you have a contract and does it include price, terms & conditions? <i>e.g. In NSW building jobs over \$1000 must come with a contract.</i>			
6. Are warranties offered on materials and workmanship?			
7. Is Council Approval or a Building Permit required? Check with your local council authority			
8. Is insurance available? <i>eg Public & product liability, home owners warranty, business insurance, professional indemnity.</i>			
THE PRODUCT			
9. Are all components quoted the same or similar? Compare fabric brand, steel and fittings.			
10. Are you satisfied that the design meets your shade requirements? <i>Is shade cast where and when required?</i>			
11. Is the product engineered?			
OTHER CONSIDERATIONS			

12. Is workplace health and safety considered? <i>Ask for safe work method or risk assessment statement.</i>			
13. Is proper consideration given to site works? <i>Ask about protection of site, removal of spoils, security.</i>			
14. Is satisfactory after sales service offered? <i>e.g. maintenance and contact arrangements.</i>			

Preferred Installer Selected:

Summary

The story of fabric structures is quite new. From architectural marvels seen at the Olympics, Formula One racing or on the most amazing buildings around the world, fabric structures have now found their way into our day to day life. Their beauty, flexibility and price make them popular in so many applications. In the home, at school, in the workplace and in public arena, fabric structures are here to stay.

After exploring the topics covered in this document it will be apparent that there is more to a fabric structure than standing up a post in a hole and stretching some cloth over it. The industry, the materials and the processes which comprise a fabric structure are specialised and continue to evolve and improve with changing technologies.

Fabric structures have a solid position in a modern building industry.

Contributors

This publication was produced due to the generous contributions made by members of the Fabric Structures Committee of the Specialised Textile Association. They are:

Beatrice Moonen B Econ, Dip Bus Admin. 30 years Specialist in business development and government. Director of Abacus Shade Structures. National award winning shade structure manufacturer.

Trevor Scott- M.Eng Membrane Lightweight Structures. Involved in the Tensile Membrane Industry for 21 years
9 years, manufacturing and installation, 12 years design and engineering.

Alan Stewart Director, Structureflex Australasia (www.structureflex.com.au) and support agent for MPanel (www.mpanel.com) fabric software products in Asia Region

George Formosa Director of ABC Products and fabricator 25 years

John Simmonds Billabong Shade who commenced business in 1995. Collaboration with industry colleagues to expand knowledge and scope for projects world-wide.

John Rebbechi Director, Port Douglas Sailmakers. Involved in the sail structure industry for over 30 years

Dimity Gannon Victorian Cancer Council.

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