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An IFAI DIVISION

All About Fabric Awnings

A guide for city officials, architects and design professionals.

Professional Awning Manufacturers Association

An IFAI DIVISION

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All About Fabric Awnings

Industrial Fabrics Association International (IFAI)

IFAI is a not-for-profit trade association whose member companies represent the international specialty fabrics marketplace. Member companies range in size from one-person shops to multinational corporations; members' products span the entire spectrum of the specialty fabrics industry, from fiber and fabric suppliers to manufacturers of end products, equipment and hardware.

Professional Awning Manufacturers Association (PAMA)

PAMA, a division of IFAI, is open to companies that manufacture or sell awnings, as well as those who supply goods/services to the awning industry.

PAMA's Mission

To establish PAMA and its members as the preferred first source for awning and awning related products and services to end users.

PAMA Objectives

- Promote, educate and implement programs to advance the fabric awning industry.
- Identify issues of common concern to the awning industry and take a proactive role in implementing and seeking solutions for those concerns.
- Raise general awareness of awnings as an image-enhancing, energy-saving and attractive additions to residential or commercial structures.
- Provide a central resource for the dissemination of information relating to the techniques, materials, standards, regulations, markets and tax information in the awning industry.

For more information, contact PAMA at 1801 County Rd. B W., Roseville, MN 55113-4061, USA; +1 651 222 2508, 800 225 4324; fax +1 651 631 9334; e-mail awndiv@ifai.com; visit PAMA's Web site: www.awninginfo.com.

Brief Summary Of Building Codes As They Relate To Awnings and Canopies

The International Code Council (ICC) was established in 1994 as a nonprofit organization dedicated to developing a single set of comprehensive and coordinated national model construction codes. The founders of the ICC are Building Officials and

Code Administrators International, Inc. (BOCA), International Conference of Building Officials (ICBO), and Southern Building Code Congress International, Inc. (SBCCI). ICC's mission is to provide the highest quality codes, standards, products, and services for all concerned with the safety and performance of the built environment. The ICC publications relating to the awning industry are Building Codes, Residential Codes, Energy Codes and Fire Codes.

Awning

An architectural fabric projection that provides weather protection, identity or decoration and is wholly supported by the building to which it is attached. An awning is comprised of a lightweight, frame structure over which a cover is attached.

Canopy

An architectural projection that provides weather protection, identity or decoration and is supported by the building to which it is attached and at the outer end by not less than one stanchion. A canopy is comprised of a lightweight frame structure over which a cover is attached.

Retractable Awning

A moveable awning that rolls or folds against a building or other structure by which it is entirely supported.

General Design Considerations

The major elements of an awning-system design are:

- Purpose
- Style, configuration, color
- Size and fit
- Economy
- Safety: egress & fire
- Stability
- Strength
- Anchorage
- Drainage
- Graphics
- Fixed vs. moveable

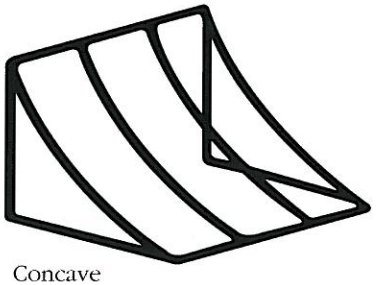
Purpose

An awning and canopy purpose would satisfy any one or all of the following functional objectives: energy savings; weather protection (sun, rain, snow, sleet, hail, wind), identification, or aesthetics (architecture).

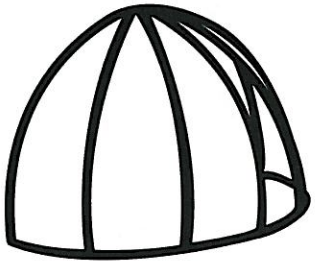
Style, Configuration, Color

Most awnings and canopies consist of fabric stretched over and secured to a fixed metal frame that is secured by laces or screws. These frames may be welded, bolted or otherwise connected. Other awnings and canopies that consist of individual fabric panels can be attached using the staple in method. Still other awnings and canopies consist of rollers and lateral arms that can be retracted manually or automatically. It should be noted, however, that the possible combinations of styles, configurations and colors are limitless.

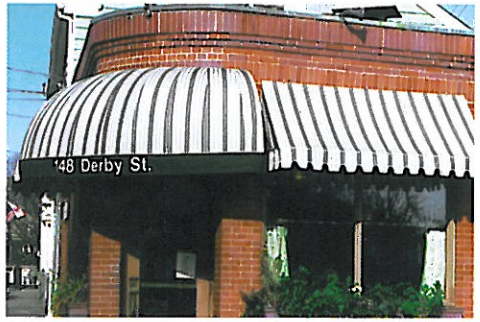
PAMA has adopted standard names for awning and canopy styles. Standard names (with accompanying designs) for awnings and canopy styles are:

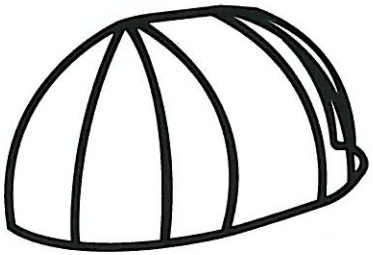


Concave

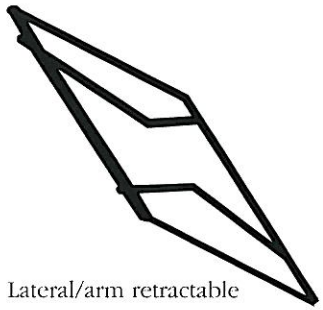


Dome

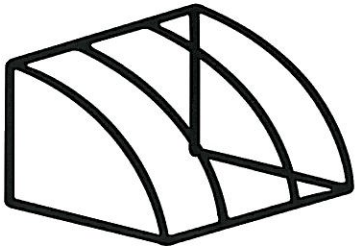




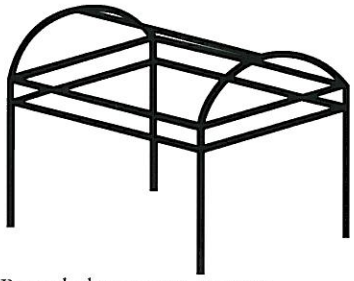
Elongated Dome



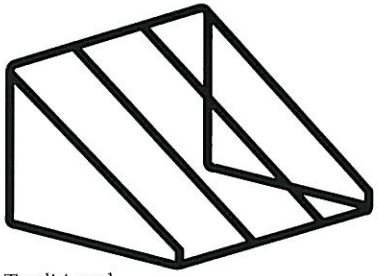
Lateral/arm retractable



Quarter round/convex



Rounded entrance canopy



Traditional

Size and Fit

The size of an awning is determined by its length, width and projection from the building to which it is attached. Other aspects of size include clear height (underneath), rise (pitch) of roof and post or rafter spacing. These features are usually important to those involved in the planning and review process.

The fit of an awning is determined by the interfacing of its frame with other connecting structures (most often a building, but frequently the ground or a concrete slab on the ground). In the case of a building, it is important to coordinate the appropriate parts of the awning frame with structural members in the building so that loads are transmitted properly.

Economy

The economy most directly affects customers and awning contractors. It is clear that an awning system should not have to meet the same code requirements as a high-rise building. However, in most cases, a code does strictly apply. In rare cases when it is not expressly required, there is still a moral and legal obligation to install an awning that can withstand any foreseeable loads.

To develop an economical awning system, the designer must understand how to arrange, size and connect structural members so that the foreseeable loads will be transmitted to its supports while incorporating safety factors, without over-engineering the system.

The awning industry and building and code officials should develop a working relationship to better understand each others' needs. In addition, the industry members' active involvement in implementing code changes is very important. The objectives should be to assure public safety and to avoid needless, expensive over-design.

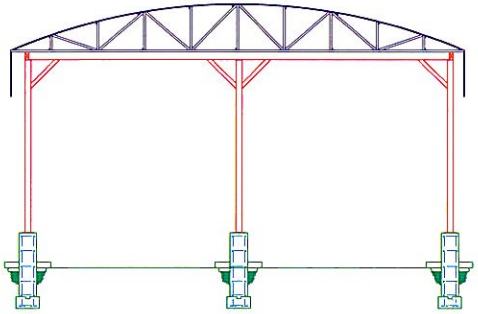
Sound economical design does not necessarily result in the lowest first cost.

Safety: Egress and Fire

Except in rare cases, this is not a significant issue with modern awning and canopy systems. In most cases, frame materials are non-combustible, and fabrics are flame-retardant. However, this point should be ascertained whenever appropriate, such as for enclosed walkway canopies and enclosed patio canopies.

The answer is not necessarily to require fire doors and sprinklers for these systems. But the building official does have the right (indeed the obligation) to design systems that provide an open, safe and quick exit to the outside.

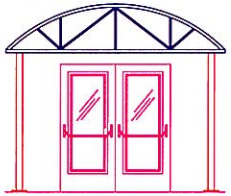
Stability

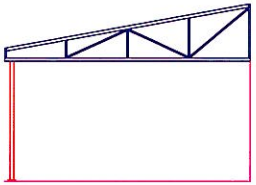


The average designer may have a concept of how beams and posts work structurally. But to design a safe structure, one must fully understand stability issues. A structure comprised of simple beams mounted on the top of simple posts is inherently unstable. This means that the structure is susceptible to falling down because of the number, arrangement and method of connection of the members.

Common post and beam structures, such as pole barns, are rendered stable by the addition of siding, roofing, "X"-bracing and fixed cantilevered footings.

Fabric has no in-plane stiffness; therefore, it does not replace, in an awning or canopy, the function that siding or roofing performs as in a pole barn. This in-plane stiffness, which is instrumental to the development of stability, can usually be supplied by triangulation of structural members.





Examples of triangulation are demonstrated as follows:

The important lesson to learn here is that substituting larger beams or posts for smaller ones doesn't solve the problem of instability.

- ***Attachments***

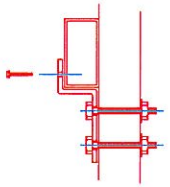
  This involves the location, style and strength of connections from the awning or canopy to the building or to its foundations.

  Proper design of this element assumes a recognition of the amount of force occurring, and the direction in which this force acts, at the connection at the time that the maximum design load occurs on the frame.

  Most common types of attachments involve bolt-through, expansion anchors, wood lag screws and adhesive anchors.

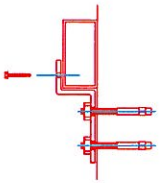
- ***Bolt-through***

  Bolt-through connections are preferable, when they are feasible, because the bolt and the nut are manufactured to controlled specifications, and there is a wealth of data on the strength provided by such a connection. Such connections are not generally subject to site questions that are often associated with other types.



- ***Expansion anchors***

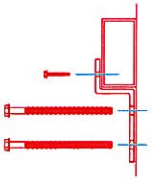
Expansion anchors are used to fasten awnings to concrete surfaces. They develop their essential strength by pressing hard against the side of the drilled hole in which they are set. This pressure results in high frictional resistance to pull-out.



While these kinds of anchors have been in successful use for a long time and may be well-manufactured, their use requires more good judgment than the use of a simple bolt-through solution. Obviously, when fastening to concrete surfaces, expansion anchors may be the only practical choice.

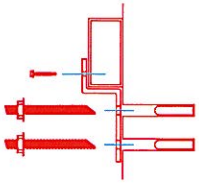
- ***Wood lag screws***

Wood lag screws are tapered to a point and do not utilize nuts. These are not as sound as bolt-through connections because they are subject to pulling out as the wood surrounding their threads crumbles or chips. Their strength, then, is proportional to the hardness of the wood in which they are embedded.



In many awning applications that require fastening to wood framing, bolt-through connections are not possible and wood lag screws may be the best available option.

Adhesive anchors



Adhesive anchors have been made available in recent years to provide the awning installer a way to address field situations in which the preceding anchor types are not suitable. Examples of such conditions are veneer brick surfaces and fasteners located close to comers, where the high pressures associated with expansion anchors will raise the risk of being pulled out. Adhesive anchors are bonded directly to the substrate by filling an oversized drilled hole, which contains the threaded fastener, with an epoxy adhesive. This system does not rely on pressure. A certain amount of cure time may be required before the anchor can be loaded.

When anchoring awnings and canopies, the awning contractor is often attaching to existing structures (building's wall, roof, foundations, slab, etc.). Responsibilities for assuring that these structures are safe for the additional loads imposed on them must be properly coordinated.

Proper anchorage is the single most important structural quality of an awning design.

Strength

After a stable configuration has been established for an awning design frame, members should be chosen for a strength consistent with the amount and type of stress imposed on them. The most common types of stress are tension, compression, bending and shear.

A common misconception about awnings is that they are safe as long as they don't fall down. All code and engineering standards have long required that a safe design use members that are 1.67 to 2 times stronger than the yield strength required to satisfy the actual design stress. The yield strength is the strength at which the material no longer fully recovers to its original shape when the load is removed; the yield strength is usually significantly lower than the ultimate strength. Thus, it can be immediately recognized that a "safe" structure is stressed well below its breaking strength when it is exposed to its maximum design load.

Drainage and Ponding

Provisions must be made to drain water off an awning or canopy. Fundamentally, this involves establishing a steep enough pitch, properly spaced bows or rafters, as well as maintaining a taut fabric, so that draining water or melting snow cannot cause the fabric to sag and collect water on the surface. Lack of proper attention to this detail can result in potentially large gravity forces on the frame and anchors.

Graphics

The overall success of a commercial awning may hinge on the design of its graphics. A variety of methods are used to apply graphics to awnings, screen printing, painting, cut out lettering, appliqué, heat color transfer, pressure sensitive graphics and eradicating. Local codes and ordinances may dictate the size and other characteristics of this feature.

Frames Fixed vs. Moveable

Frame systems are recommended by the manufacturer, according to personal preference and regional "norms." Frames are joined by special fittings or welding, according to manufacturer recommendations and regional variations.

A fixed awning's frame cannot be deployed from a stowed position and vice versa. A moveable awning can be stowed against the building to which it is attached. The standard lateral arm and drop arm awnings are examples of moveable awnings.

Benefits Of Awnings And Canopies

Fabric awnings and canopies can meet various design needs. Many modern fabrics are long-lasting, bright, easily cleaned, strong and flame-retardant. Modern frame materials offer high strength-to-weight ratios and corrosion resistance. The proper combination of these properties can result in safe, strong, economical and attractive products.

Energy

On Southern facing windows, a fabric awning reduces heat gain by 55 to 65 percent. For western exposure, the reduction in heat gain is 72 to 77 percent. The exact amount of heat reduction depends upon several factors, including the exposure of the window, the color and type of fabric and the style and placement of the awning.

Weather Protection

These systems afford protection from the sun, rain, snow, sleet and hail. In certain configurations, they can also protect from wind.

Identification, Advertising

Applying graphics directly to awning fabrics provides identification and/or advertisement without the need for "add-on" sign structures.

Architecture

Creative designers and architects can develop useful and intriguing designs for modern awning and canopy systems that incorporate shape, light, color, texture, graphics and structure, at modest cost. Most awning frames are custom made by cutting, bending and welding metal tubing, and fitting the fabric to the frame. With these custom methods, almost any shape and size can be attained and covered with awning fabric. Hence, the same surface can serve at least three necessary functions: weather protection, identification and architecture.

Design Loads

Loads for which awning and canopies may need to be designed can be categorized as follows:

Dead Load

This is the self-weight of the awning or canopy frame, fabric and hardware. This load must always be included with other design loads since it is always acting on the structure. For instance, if one were designing an awning for 20 psf snow load, and the structure it self weighed 2 psf, then the design for snow should actually account for 22 psf total load.

Wind Load

This load, as well as snow load, are usually the most critical loads on awnings and canopies. Important aspects of wind load are:

- ***Speed*** or ***Velocity***
  Basic wind pressure is a function of its speed. Basic wind pressure (psf) can be computed as the product of 0.00256 times the square of the wind speed (mph). It can be readily observed then, for example, that the wind forces on an awning are

  four times greater if the wind speed is doubled, and the forces are nine times greater if the wind speed is tripled. Design wind speeds are generally shown on maps published in the building code. Local codes may require higher design wind speeds.
- ***Exposure***
  This is a general category for the amount of protection from the wind that is afforded by the surrounding environment. Consult your local building codes for requirements.
- ***Gusts***
  These are short-term excursions of velocity above the steady design velocity, which must be accounted for in the design.

- ***Drag, Lift***
  Drag is the wind-induced pressure toward the fabric surface, and lift is the pressure away from the fabric surface. Wind forces on an awning system act in different directions (toward or away from the fabric surface depending on a variety of factors). When designing an awning frame, all these factors must be taken into account.
- ***Return Period***
  This term is used to describe the time interval which is the basis for establishing the required design wind speed. For most applications the return period is 50 years. This simply means that the required design wind speed is that which has a 0.02 statistical probability of occurring once in 50 years. Loss and safety experts have determined that it is an acceptable level of risk and have based code design requirements on it.

Snow Load

Required design snow loads are established by maps published in the building code. As in the case for wind, sometimes local requirements are more stringent. On the other hand, in many localities there is no requirement for snow load design. Check with the local department of building and safety.

Some important considerations about designing for snow are:

- ***Ground Snow***
  The beginning point for snow design, this is the pressure of the designed snow load occurring at ground level.

- ***Exposure***
  This is a general category for the amount of protection from the wind that is afforded by the surrounding environment. Consult with your local building codes for requirements.

- ***Flat Roof Snow Load***
  This is the design load occurring at the actual roof level, and results from factoring the ground snow load by a coefficient accounting for exposure and height. Many times the flat roof snow load can be as little as 0.6 or 0.7 times the ground snow load. For example, the snow map or the code may indicate a 20 psf ground snow load; the actual design pressure required for an awning may be as little as 12 psf.

- ***Drifting***
  Building codes require that the phenomenon of drifting snow be accounted for in the design of roofs; this includes awnings and canopies. While it is beyond the scope of this publication to discuss this in detail, the effects of drifting snow can be significant. The codes describe the procedure for designing with snow drifting in mind.
- ***Return Period***
  See discussion under **Wind Load**.

Live Load

These are loads that are associated with the forces related to human occupants, furniture, equipment, etc. Since these loads are movable, the live load stipulation is an allowance for the most severe anticipated condition or case. Common code requirements for roof live loads are from 12 to 20 psf. Provided that the case of ponding water is properly addressed, live loading is not a practical requirement in the design of awnings. Some codes do not require a live load design, and others greatly reduce the requirement.

Ponding

Addressed elsewhere in this publication, this is a potential load on an awning or canopy and must be addressed in one of several ways:

- Design for ponding must be taken structurally.
- Keeping the fabric properly supported and taut will avoid the problem.
- Remove snow before it melts and ponds water.

Seismic Load

These are loads due to earthquakes or earth tremors. The design process for earthquake loads is also too elaborate to be included in this publication.

However, awnings and canopies tend to fare well in earthquakes for the following reasons:

- They are lightweight; lightweight structures do not have a lot of mass, therefore, relatively small seismic forces are likely to be developed. F=ma.
- They are generally small, secondary structures. Compared to the structures to which they are attached, which are subject to significant destructive forces due to their larger mass, these structures are relatively unaffected. F= ma. Although seismic design requirements are not rigorously pressed in geographical areas not significantly affected by earthquakes, most model codes contain the provision in current editions.

Choices Of Materials

The range of modern materials available for awning or canopy designers is impressive.

The following is a brief overview of the more popular choices for fabric and framing in the industry:

Fabrics

Awning fabrics commonly come in finished widths from 30 inches to 86 inches and weigh from 6.5 ounces to 42 ounces per square yard. Popular fabric types are:

- Vinyl laminated or coated polyester (Back Lighting)
- Vinyl laminated or coated mesh
- Vinyl laminated polyester
- Acrylic, vinyl or resin-coated polyester or polyester/cotton
- Vinyl-coated, cotton or poly/cotton
- Acrylic-painted cotton or polyester/cotton
- 100% Woven acrylic
- Expanded PTFE

Some of these fabrics are heat-sealable, which results in a water-tight joint (assuming that the fabric itself is water-tight). Other properties of interest to the designer are:

- Colors
- Light transmittance
- Warranty
- UV resistance
- Water repellency
- Flame resistance
- Mildew resistance
- Wick resistance
- Graphics acceptance

Framing

- ***Steel Pipe***
  In most cases, primarily designed as a conduit for liquids or gases, pipe is sized by it's inside diameter. The size designation is referred to as "nominal" size. Pipe is characterized as having a relatively thick wall section of mild steel and is available black or hot dip galvanized in 21' lengths. It is easily welded, bolted or threaded and is adaptable to many shop environments. It is functional but heavy and not necessarily highly aesthetic. It is easily bent to designer shapes. Most hardware & fittings for use in frame construction are designed to work with Schedule 40 pipe.
- ***Steel Tubing***
  Available in a range of wall thicknesses and shapes including round, square and rectangular as well as various yield strengths. It is easily welded or bolted. The thinner wall section makes threading difficult. It is easily bent to designer shapes. Steel tubing is normally sized in outside measurements.
- ***Aluminum Pipe***
  Manufactured with the same dimensions as steel pipe, it weighs only one-third as much.
- ***Aluminum Tubing***
  This is available in a wide variety of shapes, sizes and tempers, with an array of advantages and disadvantages in comparison to steel. Tubing measurements are described with outside dimensions.
- ***Staple-on Extrusions***
  Aluminum tubing is extruded into cross-sections that are used to connect fabric panels to the face of the tubing. Connections are made stapling the fabric inside a groove that is filled with a pressure-installed weather strip/trim piece.

Historical Awnings

According to the U. S. Department of the Interior, National Park Service, Heritage Preservation Service, historic photographs from the nineteenth and early twentieth centuries offer ample precedent for the use of awnings on windows, above storefronts and at entrances. Decisions on particular projects must be based on the circumstances of each building, but as a general rule, in restoration projects, awnings are acceptable when the physical evidence or documented research clearly shows they were once on the building and the historic appearance is being accurately restored. In rehabilitation projects, awnings may be acceptable when they do not negatively affect the historic character of the building.

As "Interpreting the Standards Bulletin" No. 86-079 makes clear, awnings can in some cases so impair the historic character of a structure that denial of certification may result. However, historic photographs of streetscapes document a great profusion of awnings. Awnings of many sizes, shapes, patterns and colors ranged from one building to the next. Sometimes more than one appeared on the same building. While careful scrutiny of awnings is justifiably part of the National Park Service review of tax act projects, care must be exercised in this area not to substitute strictly personal preferences for professional evaluations of historic character.

Partnerships

When an awning or canopy is needed on a commercial building, its important to form a partnership with all or some of the following community partners: awning company, city engineer, city officials, architect and others.

Awning companies can be seen as the first source of information. They often have information about anchoring guidelines and the cost-efficiency of awnings. It is clear that an awning system should not have to meet the same code requirements as a high-rise building. However, a code does apply. There is a moral and legal obligation to install an awning that can withstand any foreseeable loads.

The architect, engineer and/or city official must understand how to arrange, size and connect structural members so that the foreseeable loads will be transmitted to its supports while incorporating safety factors without over-engineering the system.

The above partners should develop a working relationship to better understand each others' needs. Most awning companies are the experts in fabricating awnings, engineers and code officials are experts in permits, and architects experts in design. All parties are needed and can assist each other.

Professional Awning Manufacturers Association

Glossary Of Awning Terms

Awning

An architectural fabric projection that provides weather protection, identity or decoration and is wholly supported by the building to which it is attached. An awning is comprised of a lightweight frame structure over which a cover is attached.

Canopy

An architectural projection that provides weather protection, identity or decoration and is supported by the building to which it is attached and at the outer end by not less than one stanchion. A canopy is comprised of a lightweight frame structure over which a cover is attached.

Retractable Awning

A movable awning that rolls or folds against a building or other structure by which it is entirely supported.

Standard Awning Designs

Concave

Dome

Elongated Dome

Lateral Arm/Retractable

Quarter Round/Convex

Rounded Entrance Canopy

Traditional

Awning Terminology

4 – Bar

This is the term commonly used to describe a stripe in awning fabric. This is the approximate number of colored 4 inch stripes across the width of 31 inch fabric. The stripes are not exactly 4 inches, they are more like 3.8 inches. Since many fabrics are wider than 31 inch today, this term is used to describe the width of the stripe. Also known as a classic stripe.

Abrasion Resistance

Capacity of material to withstand wear due to friction, rubbing, or scraping.

Acceleration Stress

Additional stress placed on rope due to increasing the velocity of load.

Acrylic

Generic term for manufactured fiber in which the fiber-forming substance is any long-chain synthetic polymer composed of at least 85% by weight of acrylonitrile units. Made in both filament and staple forms.

Adhesive/Epoxy Anchors

Attachment for installations onto masonry (including brick, marble, stone, stucco, etc.) or concrete. Ideal for use in anchoring to a variety of base materials ranging from soft common brick to hard marble or granite.

Aluminum Pipe

Manufactured with the same dimensions as steel pipe, it weighs only one-third as much.

Aluminum Tubing

This is available in a wide variety of shapes, sizes and tempers, with an array of advantages and disadvantages in comparison to steel. Tubing measurements are described with outside dimension.

Anchorage

This involves the location, style and strength of connections from the awning or canopy to the building or to its foundations.

Anodizing

A process used to improve corrosion resistance of aluminum and it's alloys. The material is cleaned, then immersed in a bath of acids. The metal is the positive pole, or anode, in the acid bath. A current is applied and oxidation occurs. After this process is complete and the item rinsed, a second step or sealing treatment is applied. It is during this step that a chromate is applied, and various colors can be realized. This entire operation is also known as "two step anodizing."

Applique

Motif or design made separately, then sewn or affixed on a cloth or garment

Awning Cord

Small diameter cord used for attaching awning covers to a frame or structure; most commonly a cotton, polyester or nylon with stretch resistant fiber core.

Backlit Awning *(see Illuminated Awning)*

Basket Weave

Plain weave with two or more warp and filing threads interlaced to resemble a plaited basket. Has flat look, porosity, and looseness or "give". Can be very heavy or lightweight and made of any fiber.

Bolt-through

Attachment for installations mounted to a wall, or some other structure, where a bolt extends from one end of the wall or structure through the other side and securely fastened with a nut.

Braid

A narrow fabric, usually between ½"–1" wide, used as a trim. Common use is on the edge of a valance to finish the cut edge of the fabric.

Breaking Strength

The measured load required to break a fabric or rope under tension; also called tensile strength.

Cadmium Plating

An electro plating process which protects iron and steel. Salt spray tests indicate cadium is superior to zinc in corrosion resistance.

Calendering

A process of passing cloth between rollers (or "calendars"), usually under carefully controlled heat and pressure, to produce a variety of surface textures or effects in fabric.

Canvas

Cotton, linen, or synthetic in heavy weights with an even firm weave, for sails and many industrial purposes. Awning stripe canvas has printed or woven stripes.

Coated

Fabrics that are coated are usually done so with a liquid or semi liquid product. Coatings can be urethanes, acrylics, PVC, neoprene's, and many other types of substances.

- Knife over roll
  The material rolls past a knife that acts to spread a liquid substance across the width of the fabric.
- Extrusion
  Dry chemical mixes are heated and mixed through an extruder and then passed through a roller or die to flatten and spread the substance across the width of the fabric.

Coated Fabric

A fabric where a liquid or semi-liquid polymer has been applied in firmly adhering layers to provide certain properties. Examples of commonly used polymers are urethanes, acrylics and PVC. Many other polymers can be used to design fabrics for a specific end use.

Convex

An awning configuration characterized by a series of parallel bows in the shape of a convex curve. It produces a radius shape with flat ends.

Cordage

The general term that covers all rope, cord, lines, and string.

Count

1.) Number size of a yarn.
2.) Number of ends and picks per inch of a weave, or their sum, as 200 count sheeting.

Crazing

This describes the condition of scratch marks on the surface of fabrics. These can occur as a result of abrasion or folding. It is usually a topical condition and does not affect the fabric's performance except from an aesthetic point of view.

Crimp

To bend, kink, curl or wave a fiber to give it more loft.

Crocking

Rubbing off of color as a result of improper dye, poor penetration, or fixation.

Cut-out lettering

Lettering or graphic elements that are cut out of a fabric and replaced from behind with letters or graphics of another material.

Delamination

This describes the separation of the individual plies in a laminate. Laminates are typically made of two or more plies that are fused together under combinations of heat, pressure and adhesive. When a lamination comes apart, delamination has occurred.

Denier

Unit of weight indicating size of a fiber filament based on weight in grams of a standard strand of 9,000 meters. The higher the denier number, the heavier the yarn. Used in connection with silk, rayon, acetate, and most man-made fibers.

Die Casting

The forming of parts by forcing molten metal into metal molds. Castings made with this process can be made to very exacting tolerance. Zinc and aluminum are most commonly used.

Di-Electric Welding

The terms "RF (radio frequency) welding" or "RF heat sealing" are often used interchangeably with HF (High Frequency) or di-electric heat sealing or welding. When a Di-electric material comes into contact with an electromagnetic field, some portion of the electromagnetic energy will go though a change of state and be dissipated as heat with the Di-electric. The degree to which this conversion of energy will occur is dependent on the atomic and molecular structure of the material the frequency of the electromagnetic field and the field strength.

The term Di-electric heating correctly describes this phenomenon at any frequency while RF or HF heating describes this process over the limited frequency range (1 to 200 megahertz).

In the case of RF or HF welding of thermoplastics the effective mechanisms producing heat in the Di-electric are Dipolar and Interfacial polarization.

Dimensional Stability

Fabrics can stretch and shrink in the warp, fill or bias directions, depending on the construction and/ or fibers employed. When a fabric is dimensionally stable, means that stretching and shrinking have been controlled to a certain degree.

Drawing

1.) The hot or cold stretching of fibers to increase orientation and reduce size.

2.) Process of repeated drafting of fiber slivers on a carding machine and doubling and redoubling of the slivers.

Electro Galvanized or Electro Plated

This is similar to Hot Dip Galvanized except the application process is different and the final appearance is smoother and brighter. Instead of dipping the metal into a hot zinc solution, the metals are charged with positive ions and put into a negative ion solution on the metal in a more uniform manner. An average plating thickness is .0002".

Eradication

Eradication involves eliminating with special chemicals, an existing color from a white vinyl fabric that has been pre-coated at the factory with eradicable inks.

Expansion Anchors

Used to fasten awnings to concrete surfaces. They develop their essential strength by pressing hard against the side of the drilled hole in which they are set.

Extrusion Coated

Dry polymers are heated and mixed through an extruder and then passed through a roller or die to flatten and spread the polymer across the width of the fabric.

Fiber

The fundamental unit that makes up a textile raw material such as cotton or woven acrylic.

Fill Yarns

The yarns that run crosswise of the warp yarns in weaving.

Fire Proofed

A fabric or substance which has been treated so that it is absolutely impervious to flame, and will not, under any circumstances, support a flame. Erroneously used in reference to fire retardant goods.

Fire Retardant Finish

A finish rendering a cloth which will repel flame, or which will prevent the spreading of flame, or which will not support a flame. Usually tested for length of time it takes for a flaming portion of the cloth to extinguish itself.

Fluropolymer

This is a synthetic fiber noted for its resistance to sunlight and ulta-violet deterioration. This material will not degrade in outdoor applications for an almost unlimited period. Fabric attachments:

- Awning Molding
  Usually made of aluminum, this track system has channels that accept the rope-filled hem of an awning cover.
- Lacing
  This is the most traditional technique of attaching a fabric cover to an awning frame. Grommets are placed along the edge of the fabric cover. The cover is tied to the frame by lacing thin rope through the grommets.
- Screws
  Fabric attachment that uses screws for fastening. The cover is stretched tightly over the frame and attached using self-tapping hexagonal screws.
- Staples
  A fabric attachment that uses staples to attach the fabric to a frame system instead of screws. The fabric is stretched over a frame, then stapled to the frame.
- Staple-in-Extrusions
  The fabric is stapled into "slot" built into specially designed framing. The slots are then covered with strips of vinyl trim

Grab Tensile

This is a property of fabrics where a machine will try to pull the fabric apart in opposite direction in both the filling and warp directions. The resulting effort to do this is measured in pounds.

Hand Painting

A process whereby graphics are hand-painted directly on fabric.

Heat Color-Transfer

A graphic process that utilizes heat and a vacuum applicator to adhere color to the fabric. Any number of colors can be applied simultaneously, as pigments and resins are embedded into the fabric.

Hot Dip Galvanized

This refers to a finish that is the result of metal being dipped into a hot solution of zinc to add a protective, coating to the metal. Awning iron and some malleable fittings have typically been hot dip galvanized.

Hydrostat Pressure

The ability of a fabric to resist water under pressure and is expressed in inches of water column.

Illuminated Awning

A lighting system placed behind the fabric structure causing the fabric to be illuminated.

Jacquard Weave

The type of weave to be seen in damasks, brocades, tapestries, and other complicated cloths. Made n a Jacquard loom which provides mechanisms to control the action of each warp yarn individually, if necessary.

Knitted Fabric

It is different from weaving in that it uses a tying stitch to hold the other yarns together. Knitted fabrics typically stretch more than woven fabrics. Many of the substrates used in laminates are knitted because knitting is usually faster and, and therefore, less expensive than woven fabrics.

Lacing

This is the most traditional technique of attaching a fabric cover to an awning frame. Grommets are placed along the edge of the fabric cover and then the cover is tied to the frame by lacing thin rope through the grommets.

Lag screws

Screws which are tapered to a point and do not utilize nuts. Their strength is proportional to the hardness of the wood in which they are embedded. In many awning applications that require fastening to wood framing wood lag screws may be the best available option.

Laminate

Combine the above two definitions to read: Laminated fabrics are made of two or more plies fused together under a combination of heat, pressure and adhesives. They are normally constructed of a plastic top and bottom layer and an intermediate scrim layer.

Lateral Arm Awning *(also see* ***Retractable Definition****)*

These awnings resemble typical traditional triangular structures except they rarely have end fabric panels and they include a manual or electric cranking system that allows the awning to be rolled up or retracted against the wall.

Load

A load is anything that causes force to be exerted on a structural member.

- Dead Load
  This is the self-weight of the awning or canopy frame, fabric and hardware. This load must always be included with other design loads since it is always acting on the structure.
- Wind Load
  Basic wind load is a function of its wind speed. Basic wind pressure can be computed as the product of 0.00256 times the square of the wind speed (mph).
- Snow Load
  A load imposed on a structure from snowfall. Snow leads vary considerably from region to region.
- Live Load
  All changing loads exerted on a roof.

Mesh

Any fabric, knitted or woven, with an open texture, fine or coarse.

Mildew Proof

It is unlikely that any fabric can be rendered permanently mildew proof under all conditions "Mildew Resistant" is a more proper term. Usually refers to a treatment on a cloth with various non-toxic chemical compounds that poison or discourage the growth of mold and fungi. Effectiveness is directly proportional to the type of fungicide and the quantity of fungicide contained in the finished cloth (to the point of maximum potency). The treatment may be durable or non-durable.

Modacrylic

Generic name established by the Federal Trade Commission for "a manufactured fiber in which the fiber-forming substance is any long-chain synthetic polymer composed of less than 85% but at least 35% by weight of acrylonitrile units, except when it qualifies as rubber".

Modulus

This is a measure that tries to explain how a fabric reacts when it tensioned and relaxed. It is used to explain things like snow and wind loads, elasticity, memory, stretch and shrinkage.

Monofilament

A single filament of manmade fiber, used as yarn.

Natural Fiber

Any organic fiber such as cotton, jute, manila, sisal, etc.

Non-Woven

Neither woven, knitted, nor spun. A material made of fibers in a web or mat held together by bonding agent.

Nylon

Any of a family of high strength, resilient synthetic materials, the long-chain molecule of which contains the recurring amide group CONH.

Painted Cloth

Cloths which have been finished by painting in solid colors or in assorted stripes. The paint is generally applied to the surface of the cloth from fonts as the rolls of cloth pass under them. Used for awnings, outdoor furniture, umbrellas.

Pigmenting

The process of applying color to fiber stock, yarn or fabric.

Plain Weave

One of the three basic weaves. In plain weave, each filling yarn passes successively over and under each warp yarn with each row alternating.

Polyester

A synthetic fiber used for it's strength and resistance to ultraviolet deterioration. It does not have the stretch and elasticity of nylon and, as a result, will often last longer.

Polymer

A synthetic material from which fibers are formed. Usually composed of large molecules (monomers) with each other.

Ponding

This involves establishing a steep enough pitch, properly spaced bows or rafters, as well as maintaining a taut fabric, so draining water or melting snow cannot cause the fabric to sag and collect water on the surface.

Pressure-Sensitive Graphics

Pressure-sensitive vinyl film is cut by hand or by computer to a desired design and then adhered in the proper register on the fabric as decoration.

Pre-stress

The effective long-term stress for which an awning is designed; the load in the awning that results when the fabric is pulled tight on the frame. This stress exists in the awning fabric and acts on the frame, even when the awning is not acted upon by the service loads.

PVC

Polyvinyl Chloride. A polymer used for vinyl fabric.

RF Welding or RF Heat Sealing *(see Di-Electric Welding)*

Retractable Awning

A movable awning that rolls or folds against a building or other structure by which it is entirely supported.

Screen Printing

Similar to stencil work, except that a screen of fine silk, nylon, polyester or metal mesh is employed. Certain areas of the screen onto the fabric by a squeegee to form the pattern. Separate screens are used for each color in the pattern. More expensive than roller printing, but for limited yardage and more delicate designs, often more economical. Graphic application method capable of printing great detail and color.

Seismic Load

These are earthquakes or earth tremor loads.

Shear

Force that causes a body to shift away from the acting force where it is not supported.

Solution Dyed

The process in which the color (pigment) is added to the liquid "solution" prior to fiber formation. By being added during the liquid state, the pigment becomes an integral (inherent) part of the fiber resulting in improved UV resistance.

Spray-painting or air brushing

Hand painting made sophisticated as it can achieve color blending or shading plus sharper edges by spraying inks on fabric.

Stainless Steel

As the name implies, this is a special steel alloy that is made more stainless than regular steel, due to higher concentrations of chromium and nickel. Note it does not say stain proof. There are many grades of stainless steel, the more common being #304 and #316. #304 is commonly used for wire forms, and #316 for investment castings.

Staple on Extrusions

The fabric is stapled into "slot" built into specially designed framing. The slots are then covered with strips of vinyl trim.

Strain

The measure of the change in size of shape of a body under stress, compared to its original size or shape. It is usually measured as the change (in inches) per inch of length.

Steel Pipe

This material can be characterized as a relatively thick, round section of mild steel, with manufactured foot lengths up to 24'-0". It is easily welded, bolted and threaded, and is adaptable to many shop environments. It is heavy and functional.

Steel Tubing

Steel tubing is similar to steel pipe, but available in a range of wall thickness and shapes, including round, square and rectangular. It is easily welded or bolted, and can be obtained in higher strengths than steel pipe.

Stress

The force-per-unit area.

Substrate

The surface to which an awning frame is attached. A substrate also is a base fabric.

Tongue Tear

This is a property of fabrics where a machine will tear a strip of fabric across the warp and filling. The resulting effort to this is measured in pounds.

Top Coating

The coating intended for the front, side or top of a fabric or membrane.

Ultimate Strength

The maximum strength under which an awning material is capable of sustaining a gradual and uniformly applied load.

UV Resistance

Ability to retain strength and resist deterioration due to on from exposure to sunlight.

Warp Yarns

The yarns that runs lengthwise and parallel to the salvage in the machine direction of a woven or warp knitted fabric.

Waterproof

The use of the term in relation to treated cotton ducks is prohibited by the Fair Trade Practices Act "unless the product shall be impervious to the passage of any water so long as the fabric may endure". Water Resistant is the proper designation for cloths treated to resist water penetration and leakage.

Water Repellent Finish

A finish either durable, applied to cloth which makes it relatively impervious to the effects of water repellent finishes does not close the pores of a cloth.

Weave

The configuration of threads running perpendicular to one another. A plain weave places weft thread over the warp thread in sequence, then reverses for the next row of threads.

Webbing

A sturdy fabric woven in narrow widths for use where strength is required as for seat belts, head bands, etc.

Weft Yarns

The yarns that run crosswise of the warp yarns in warp knitting.

Welt

A strip of material seamed to a pocket opening as a finishing and a fabric strengthening device.

Welt Cord

A tape or covered cord sewn into a seam as a reinforcement or trimming.

Wicking

A phenomenon that occurs when moisture accumulates at the edge of a fabric where substrate yarns may be exposed, or in sewn seams where threads come in contact with the substrate and moister is absorbed into a fabric.

Wickability

The property of a fiber that allows moisture to move rapidly along the fiber surface and pass quickly through the fabric.

Working Load

Working Load (Or working strength) is the weight in pounds that is recommended for safe working conditions. It is applied to new rope in good condition with appropriate splices and only under normal service conditions. Where dynamic loading may occur, the recommended working load should be adjusted accordingly.

Woven Fabric

Fabric composed of at least two sets of yarns; sone warp (longitudinal) and one filling (crosswise), laced at right angles to each other.