

Solar Shading Louver Systems



IntelligentEnvelopes[™]

Introduction

Mestek has a strategic alliance and exclusive licence agreement with Colt Group USA. Mestek is the exclusive licensee to produce and market the Colt designed products for the US market and all products are produced in the USA.

Additionally, Mestek's Architectural activities include Linel and AWV. The emphasis for these companies is in providing products and solutions that beautify and improve the performance of buildings through Intelligent EnvelopesTM.



The movement toward sustainable building designs is being driven largely by environmentally-sensitive building owners and/or their prospective tenants. As these owners and their consultants weigh their design objectives and alternatives, they often find that exterior solar shading systems are an ideal part of the "green" solution for their buildings.

An exterior solar shading system blocks a significant amount of the solar radiation from entering the building's windows - which results in reduced HVAC installed costs due to equipment down-sizing and reduces operating costs due to reduced cooling loads.

Indeed, some form of exterior solar shading is now part of the prescriptive design requirements in the new Standard for the Design of High Performance, Green Buildings, except for Low-rise Residential Buildings (ANSI, ASHRAE's, USGBC, IES 189.1).

SHADING LOUVERS

Solar shading louver systems are one of the most effective ways to reduce air conditioning loads, while offering designers the opportunity for distinctive architectural impact.

Radiation from the sun is transmitted, absorbed and reflected by the louvers. As a result solar heat gain is prevented from passing into the building. If an operable system is chosen, the adjustable louvers will track the position of the sun increasing the systems shading effectiveness and further reducing glare. On overcast days, the operable louvers can be opened to maximize the natural daylight into the building.



COLT'S OFFERING

- Computer modeling of the solar shading louver system including calculation of sun angles and reduction in solar heat gains by exposure throughout the year.
- All Colt solar shading louver systems are custom designed for your application and can be provided in various configurations, materials, finishes and coatings to meet each project's requirements.
- Two control options are available for the operable systems – SolTronic III for most projects and the ICS 4-link for very large projects with additional functionality.
- All systems are durable with low maintenance needs.

COLT'S TRACK RECORD & CAPABILITIES

Colt has more than 40 years experience in the design and supply of solar shading louver systems. Colt was the first to incorporate electricity generating photovoltaic cells into solar shading systems. Colt continues to build on this experience and has been providing solar shading systems for the US market since 2006.

We offer an extraordinary range of solar shading systems from fixed to fully operable with a variety of carrier systems, materials and finishes.

Colt is dedicated to innovation and has comprehensive design capabilities. While this brochure provides a general overview of our capabilities, we welcome the opportunity to develop solutions to satisfy your unique requirements.



SOLAR GEOMETRY

The sun rises in the East and sets in the West. The sun travels in an arc, reaching its highest altitude in the summer and its lowest altitude in the winter.

NORTH FACING FAÇADES

For predominately north facing façades in all but the lowest latitudes the façade will not receive direct sunlight and solar shading is not required or beneficial from an energy perspective.

Shading louvers may be used for an asthetic look complimentary with the other south, east and west facing façades.

SOUTH, EAST AND WEST FACING FAÇADES

For a predominately South facing façade, a small amount of solar shading can be achieved using a fixed horizontal brise soleil sunshade. In winter such a device, however, cannot stop direct rays from the sun penetrating the building's windows since the sun is much lower.

While passive solar heating at times is beneficial, some might be surprised to learn that the cooling loads on many southern-facing zones peak in the late fall/early winter due to the solar radiation.

With a predominately East or West facing façade, a fixed system will not perform well throughout the day as the altitude of the sun varies throughout the day.

Effective solar shading on the South, East and West façades can be achieved only by using an operable shading louver system on the building's façade. The angle of the louvers is adjusted throughout the day to provide optimal shading.





South facing (Northern Hemisphere)



Colt offers a variety of materials and finishes for the shading louvers -

- Shadoglass Glass with various colors, surface finishes, patterns and coatings
- Shadovoltaic Glass with photovoltaic cells
- Shadoprism Non-specular prisms
- Shadotex Textile fabrics
- Shadometal Metal solid or perforated
- Shadotimber Timber wood

SHADOGLASS

Shadoglass are fixed or operable exterior solar shading systems that incorporate glass louvers. The louvers can be installed either horizontally or vertically on the building's façade. A Shadoglass shading system can significantly reduce solar heat gain while providing unobstructed views and natural daylight. With today's glass technology, very effective shading performance can be achieved with glass louvers.

Louver Materials

& Finishes

Glass louvers are available in various colors, surface finishes, patterns and coatings to meet specific design requirements. This enables the designer to control the quality of light entering the building.

- Available in widths up to a nominal 24".
- Available in unsupported spans up to a nominal 6.5', supported spans up to a nominal 13' (depending on wind loads and other design criteria).
- Wide range of colors, surface finishes, patterns and coatings (i.e. fritted).
- All principal support components are manufactured from corrosion-resistant extruded aluminum alloy with stainless steel fixings.
- Fully operable or fixed.













SHADOVOLTAIC

Shadovoltaic are fixed or operable exterior solar shading systems that incorporate glass louvers with photovoltaic cells integrated into the glass to generate electricity at the same time as providing shading. The louvers can be installed either horizontally or vertically on the building's façade.

Both monocrystalline and polycrystalline cells are available. The photovoltaic cells may be integrated into the glass, either by attaching them on the underside of the glass louver or by laminating them between two layers of glass. The glass panels are heat soak tested toughened glass with the edges treated to remove stress. Glass thicknesses of between a nominal 0.3" and 0.6" are available. The glass specification can be tailored to suit each application.

Photovoltaic glass louvers are available in various colors, surface finishes, patterns and coatings to meet specific design requirements.

- Combines the functions of solar shading with the generation of electrical power.
- Available in widths up to a nominal 24".
- Available in supported spans up to a nominal 13' (depending on wind loads and other design criteria).
- All principal support components are manufactured from corrosion-resistant extruded aluminum alloy with stainless steel fixings.
- Fully operable or fixed. An operable BIPV system which tracks the sun's position typically generates about 20% more electricity than a fixed system.















SHADOPRISM

Shadoprism are operable exterior solar shading systems that incorporate non-specular prismatic plates.

The system is a transparent sun protection system for façades and glass roofs that prevents the ingress of the direct sun's heat into the interior of the building and at the same time lets through a maximum of diffuse daylight.

Total reflection of the daylight occurs where the prism angle is 90° relative to the daylight. This total reflection functions only within a very narrow range of angle. As such, the operating prismatic louvers will track the sun's position – reflecting the maximum amount of direct sunlight while allowing in all the diffuse light.



On overcast days, the prism louvers can be opened to allow unhindered vision and maximum natural daylight through the glazing.

Features and benefits

- Highly effective shading performance with maximizing natural diffuse daylight into the building.
- Available in widths up to a nominal 24".
- Available in unsupported spans up to a nominal 6.5', supported spans up to a nominal 13' (depending on wind loads and other design criteria).
- All principal support components are manufactured from corrosion-resistant extruded aluminum alloy with stainless steel fixings.





Normally operable.





SHADOTEX

Shadotex are fixed or operable exterior solar shading louver systems that incorporate a unique, alternate solar shading solution. It consists of a special fabric stretched between two sides of a louver support frame. The fabric is manufactured with a weave to prevent solar glare and solar heat gain. The fabric can also create attractive diffused light and allow a degree of vision. The louvers can be installed either horizontally or vertically on the building's façade.

This type of system is extremely light weight which allows for very large spans without the need for additional supporting framework.

- A wide variety of fabric and color choices including PVC-coated polyester, Teflon glass fiber, silicon glass fiber and ETFE (colored, translucent or screen printed).
- High solar absorption and high solar reflection.
- Light weight construction ideal for large spans.
- Good external visibility.
- Easy to clean as the fabric is typically resin/Teflon coated.
- All principal support components are manufactured from corrosion-resistant extruded aluminum alloy with stainless steel fixings.
- Fully operable or fixed.













SHADOMETAL

Shadometal are fixed or operable exterior solar shading systems that may be installed vertically or horizontally onto the building's façade or roof, and incorporate metal louvers. Perforated, solid, curved louvers and other configurations are available. The perforated louvers can also create attractive diffused light and allow a degree of vision.

- Available as standard in widths up to a nominal 16" in one piece construction and up to 41" in multiple (clipped together) construction.
- Available in unsupported spans up to a nominal 33' (depending on wind loads and other design criteria).
- Solid or perforated for improved visibility.
- Wide range of over 20 standard louver profiles.
- All principal support components are manufactured from corrosion-resistant extruded aluminum alloy with stainless steel fixings.
- Fully operable or fixed.











SHADOTIMBER

Shadotimber are fixed or operable exterior solar shading louver systems that incorporate a unique, alternate solar shading solution. It consists of timber wood louvers, usually western red cedar which, if left untreated, ages to a silverygrey tone. The louvers can be installed either horizontally or vertically on the building's façade.

Alternatively, a simulated wood appearance can be provided on shadometal louvers through a dyesublimation process which will remain colorfast at the original appearance.

This type of system is generally intended for shorter spans without the need for additional supporting framework.

- Although normally western red cedar, other types of timber wood can be provided.
- Ideal for shorter spans and thinner louvers.
- All principal support components are manufactured from corrosion-resistant extruded aluminum alloy with stainless steel fixings.
- Fully operable or fixed.







Colt offers a variety of carrier systems for the solar shading systems -

- System 1 Center pivot supported at various points along the length by a torsion tube
- System 2 Center pivot point-supported at the ends
- System 3 Center pivot continuously supported over the entire length by a torsion tube
- System 4 Back pivot point-supported at the ends
- System 5 Center pivot continuously supported at the ends

CARRIER SYSTEM I

Intended for wider spans, carrier system 1 incorporates a central aluminum torsion tube along the entire length of the louver, and is ideal for continuous facades, as well as for roofs.

For glass louvers, cross sectional widths from a nominal 12" to 24" are available.

This carrier system is also suitable for use with a variety of louver materials including glass, metal, fabric, timber wood, terracotta clay and translucent acrylic.









Glass Parameters Table

Dimensions	LSI - 55	LSI - 65A	LSI - 65B
A (max)	98.42"	129.92"	129.92"
	.8 " - 9.68"	13.78" - 21.65"	16.54" - 23.62"
С	2.36"	2.36"	2.36"
D	0.39"	0.39"	0.39"
Angle of rotation	0 - 100°	0 - 100°	0 - 100°
Torsion tube dia.	2.17"	2.56"	2.56"

Note: Table to be used as a guide only. Allowable dimensions depend upon the specific requirements of the project.





CARRIER SYSTEM 2

Primarily intended for shorter spans or where frequent anchor support points are available, carrier system 2 provides minimum obstruction from the louver so when used with glass louvers it maximizes the natural daylight and enhances the views to the outside.

For glass louvers, carrier system 2 is available in cross sectional louver widths of up to a nominal 20".

This carrier system is also suitable for use with a variety of louver materials including glass, metal, fabric, timber wood, terracotta clay and translucent acrylic.









Straight carrier bracket



Glass Parameters Table

Dimensions	LS2-30
A (max)	78.74"
	19.68"
	2.36"
D	0.39"
	66.93"
Angle of rotation	0 - 100°

Note: Table to be used as a guide only. Allowable dimensions depend upon the specific requirements of the project.





CARRIER SYSTEM 3

Like carrier system 1, carrier system 3 is intended for wider spans and incorporates a discreet central aluminum torsion tube along the entire length of the louver. It is ideal for continuous facades as well as for roofs.

For glass louvers, carrier system 3 offers spans up to a nominal 13 feet long without adding any additional supporting structure and cross sectional louver widths up to a nominal 24".

This carrier system is also suitable for use with a variety of louver materials including glass, metal, fabric, timber wood, terracotta clay and translucent acrylic.



Glass Parameters Table



Dimensions	LS3
A (max)	157.48"
В	23.62"
С	2.36"
D	0.20"
Angle of rotation	0 - 100°

Note: Table to be used as a guide only. Allowable dimensions depend upon the specific requirements of the project.





CARRIER SYSTEM 4

Carrier systems 1, 2, 3 and 5 are center pivoted systems. System 4 provides a back hung end pivoted solution with hidden control mechanisms integrated within the main vertical mullion supports. This allows for seamless continuous louvers with unobtrusive supports when viewed from the outside.

For glass louvers, carrier system 4 offers smaller spans up to a nominal 6 feet long and in cross sectional louver widths up to a nominal 24".

This carrier system is also suitable for use with a variety of louver materials including glass (with our without photovoltaic cells), metal, fabric, timber wood, terracotta clay and translucent acrylic.





Glass Parameters Table

Dimensions	LS4
A (max)*	70.87"
	13.78" min / 23.62" max
	2.56"
D	0.39"
	0 - 85°

Note: Table to be used as a guide only. Allowable dimensions depend upon the specific requirements of the project.

* If spanning across an intermediate mullion, max 141.73".





CARRIER SYSTEM 5

Carrier system 5 is a fully centered pivoted system which provides maximum visibility. Louvers are supported at each end by a bonded and extruded end cap.

For glass louvers, carrier system 5 offers smaller spans up to a nominal 6 feet long without any additional support work, in cross sectional louver widths up to a nominal 24".

This carrier system is also suitable for use with a variety of louver materials including glass, metal, fabric, timber wood, terracotta clay and translucent acrylic.



Glass Parameters Table

Dimensions	LS5
A (max)	70.87"
В	23.62"
С	I.97/2.36"
D	0.39"
Angle of rotation	0 - 100°

Note: Table to be used as a guide only. Allowable dimensions depend upon the specific requirements of the project.





Controls

OPERABLE VERSUS FIXED SYSTEMS

Operable solar shading louver systems adjust the shading louver's position to provide the most effective shading. The benefits of increased shading effectiveness and resultant energy savings far exceed the modest cost addition between a fixed and fully operable system.

With operable systems occupant comfort can also be enhanced as glare can be lessened during bright days, while maximizing the natural daylight entering the building when overcast. Typically, multiple banks of louvers are operated by linear actuators though a system of levers and push rods or by rotary actuators through a system of worm gears.

SOLTRONIC III

The Solaronic III system can control up to 15 groups of actuators (exposures) with 15 actuators per group which is enough for the vast majority of systems.

ICS 4 LINK

The ICS4 Link system can be programmed with customer specific programs. It can handle a very large number of exposures and actuators through the main control panel w/CPU (and sub-panels w/CPUs). The ICS4 Link system can be fully integrated with a BMS and offers remote access over the Internet, data logging and other datadriven operating flexibility/features. With both control systems, the actuators typically have a cycle time from fully closed to fully open of about 90 seconds. To fully calibrate/synchronize the actuators/louvers as there are slight differences in each actuators cycle time, each actuator is provided with a MSG.

At the initial commissioning, all the actuators will be cycled and the MSG will adjust the control of each actuator to account for the slight differences in cycle time to assure proper alignment of the louver blades.

With an ICS 4 link system should a problem with an operable system arise, Colt can investigate the problem remotely communicating with the control system over the internet to trouble shoot most problems.







CONTROL FUNCTIONALITY

Colt operable shading louver systems employ a weather station to provide much more functionality. The weather station (usually one per building) is typically installed on the roof and includes:

- Lux sensor for brightness
- Wind speed sensor
- Water (rain/ice/snow) sensor
- Outside air temperature sensor



In addition to management of the shading louvers positions though its sun tracking program, Colt's control systems with weather station have many more features:

- The control systems have a relay to interlock with the fire alarm system. If there is a fire alarm, the louvers are driven to a fully open (horizontal) position.
- If the wind sensor indicates a wind speed in excess of about 25 MPH, the louvers will be driven to the wind safe position (the most effective wind safe position is 37 degrees down from horizontal).
- If the outside air temperature approaches 32° F per the outdoor air temperature sensor and water is detected by the water sensor, the louvers are driven to the freeze protection position (slightly less than fully closed).

This is a major advantage of operable over fixed systems. Snow and ice can gather on a fixed blade (even at a 45 degree angle). This snow and ice can ultimately fall endangering the pedestrians below. With the operable system's freeze protection position, this concern is greatly reduced. Operable systems have another major advantage over fixed systems. The moving louver blades discourage birds from perching and nest building as opposed to a fixed system which does not.

- The control systems have a maintenance switch. If the maintenance switch is activated the louvers are driven to a fully open (horizontal) position for cleaning.
- The control systems have a 24-hour clock. If it is "after dark" the louvers are driven to their nighttime position (which could be anything from fully open to fully closed). From a nighttime "light pollution" perspective, the nighttime position would normally be fully closed.
- If it is an overcast day as sensed by the lux sensor (under 15k lux), the louvers will be driven to the fully open (horizontal) position. (As a comparison, a bright day might have a lux reading of 80k lux).
- If none of the above conditions are present, the control system will position the louvers automatically per the sun tracking software.



Installation and Maintenance

INSTALLATION

A wide variety of mounting options are possible including mounting the shading louvers directly to the curtain wall mullions or to the building structure. The method to be used for each project requires structural analysis and engineering to account for the dead weight, wind, snow and ice loads. Please consult with us on the most appropriate mounting method for your specific project.



Proper alignment of the mullions is key to a smooth installation.

In some cases the louvers can be factory pre-assembled or "unitized" to reduce installation time.

In either case, the operating mechanisms such as bearings, rods and levers are typically factory installed and aligned in the mullions. After commisioning, a capping piece will be installed on the mullions to protect these mechanisms from the elements.

COMMISSIONING

Proper commissioning by experts is essential. We recommend that our staff commission and certify the system.

MAINTENANCE

The actuators linkages and non-lubricated bearings are free from routine maintenance. An annual visual inspection of the shading louvers should be sufficient.

The actuators are tested to 10,000 cycles in each direction (20,000 total).

Should a louver or window behind the louver need replacement, Colt typically employs a spring-bolt mounting design which allows for the removal of each individual louver independently avoiding the need to remove all the preceeding louvers within the row.

WASHING

The washing method to be used of the surfaces of the exterior windows and shading louvers is normally anticipated in the solar shading louver system's design. A titanium dioxide coating can be provided on the glass louvers to reduce the maintenance effort associated with glass cleaning.

A variety of window washing approaches can be accommodated.

A bosun's chair can be lowered between the exterior windows and shading louvers.



The use of a working platform lowered between the exterior windows and shading louvers is a common approach. In some cases, rails or cradle runners are integrated into the mullions and supporting structure to guide the working platform. In other cases, outriggers can be provided to protect the windows and shading louvers from the working platform.



Catwalks can be incorporated into the structure supporting the shading louvers. This approach is less common due to the expense of the additional structural elements.



Custom Solutions



Colt is dedicated to innovation and has comprehensive design capabilities. While this brochure provides a general overview of our capabilities, we welcome the opportunity to develop solutions to satisfy your unique requirements. The following are a few other custom solutions we have provided on selected projects.

TEXTURED LOOK

Varying the ceramic frit in a random pattern on the Shadoglass louvers can give the building a distinctive aesthetically pleasing textured look.



FULLY OPERABLE AND RETRACTABLE VENETIAN BLINDS WITHIN A DOUBLE FAÇADE

Double façades are gaining in popularity due to their energy savings. To increase these saving further, Colt can provide large venetian blinds that lower and track the sun's position for maximum shading effectiveness. When the sky is overcast, the blinds can be fully retracted to maximize views to the outside and the natural daylight entering the building.



INSERTS

Shadometal louvers can be provided with the ability to accept an insert to compliment the other elements of the building's façade. In this case terra cotta inserts were used to make a striking architectural appearance.



PHOTOVOLTAIC LOUVERS WITH INTEGRATED DAY LIGHTING

The Shadovoltaic (blue tinted) louvers in the center of the shading louver system generate power for the building's use. Their position is constantly adjusted as the louvers track the sun's position to maximize the electricity generated. The Shadoprism louvers (white tinted) above and below the Shadovoltaic louvers reflect direct sunlinght, while allowing indirect light for natural daylight into the building.



Portfolio of Selected Projects



NEW YORK TIMES HEADQUARTERS New York, NY Renzo Piano-Fox/ Fowle Architects Operable Shadometal



SCHOOL OF ARCHITECTURE, UNIVERSITY OF VIRGINIA Charlottesville, VA William Sherman and SMBW Architects Operable and Fixed Shadoglass



NORTHWEST VISTA (ACCD) COLLEGE LIBRARY San Antonio, TX Overland Partners Architects Operable Shadometal



ONE RIVER TERRACE Battery Park, NY Polshek Partnership and Ismael Leyva Architects Operable Shadovoltaics and Shadowmetal





PAPAGO GATEWAY CENTER Tempe, AZ Smith Group Architects Operable Shadometal



HAMILTON COLLEGE Clinton, NY Butler Rogers Baskett Architects Fixed Shadometal



ADVANCED ENERGY CENTER, SUNY STONYBROOK Stonybrook, NY Flad Architects Operable Shadovoltaics



NATURE RESEARCH CENTER – NC DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES Raleigh, NC O'Brien/Atkins Associates Operable Shadoprism

CSSLS-B-1

MF 10 71 13 - Exterior Sun Control Devices





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