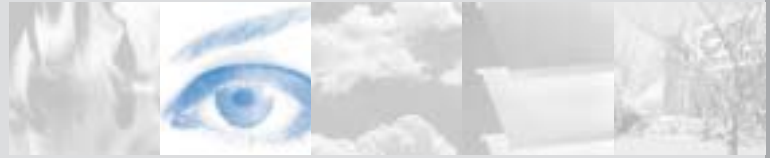




# Shadometal

Solar Shading System



Architectural Products - Solar Shading

- Smoke Control ·
- Solar Shading** ·
- Daylighting ·
- Louvre ·
- Air Handling ·
- Climate Control ·



# Introduction



## COMFORT & SOLAR HEAT GAIN

We can all appreciate the benefits of working in an environment where the temperature is comfortable. For office buildings in the summer, the optimum setting is 24°C, with a range of +/- 4°C.

However, in many of today's office developments this temperature band can soon be exceeded, especially during the hotter months, due to the effect of solar radiation through glazing. Temperatures as high as 35°C to 40°C have been recorded.

Independent studies have shown that productivity increases when workers are sat next to a window, enjoying the benefits of natural daylight. A lack of daylight can result in an over use of artificial lighting, contributing to internal heat gain.

Direct sunlight which penetrates glazing can account for a significant element of the total heat load within a building.

During the summer months this can result in an uncomfortably warm environment adversely affecting productivity and concentration levels of the occupants inside. Alternatively in air conditioned buildings uncontrolled solar heat gain can increase cooling loads, plant size and running costs.

In order to effectively regulate the internal temperature, and better protect the environment through the design of low energy buildings, the use of natural ventilation and solar shading is becoming increasingly popular.

The sun rises in the East and sets in the West. The sun travels in an arc, reaching its highest altitude in the South (for Northern hemisphere), (figure 1)

## SHADOMETAL

External solar shading is a most efficient method of reducing solar heat gain within a building and, when designed effectively, can reduce solar gains by up to 85%.

Colt offer two external solar shading systems within the Shadometal range:

Solar C, a fixed solar shading system which is Brise Soleil. Solar C is an extruded louvre system which is installed either horizontally or vertically onto the building façade

and

Solarfin, a system of fixed or controllable fins offering greater design flexibility. When linked to sun tracking control software a controllable solarfin systems offers the ultimate performance without compromising light levels on dull days.

Additionally, glass louvre systems also compliment Colt's solar shading range. For further information please refer to Colt Shadoglass leaflet No. PD 44.

## COLT EXPERIENCE

Colt has more than 40 years experience in designing solar shading and architectural design solutions.

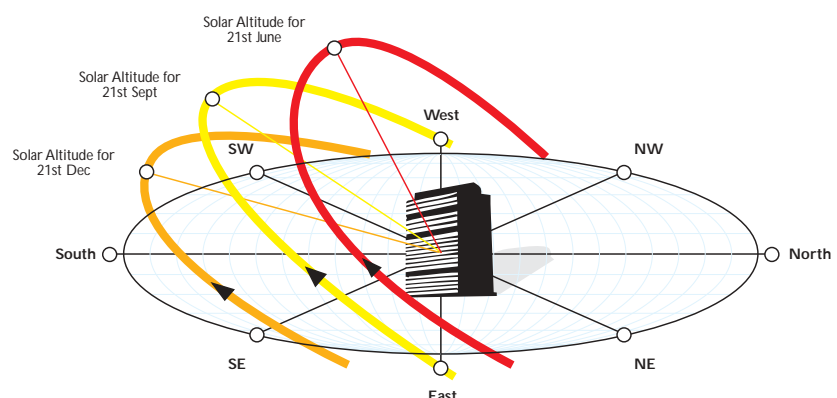
With operating companies strategically located worldwide, Colt has a broad product portfolio to meet your needs. In fact, Colt Group has one of the largest portfolios of ventilation and shading products anywhere.

Colt pioneered the design of external solar shading utilising both glass (Shadoglass) and metal (Shadometal) louvres, even incorporating photovoltaic cells (Shadovoltaic) into them to generate power from the sun.

Colt understands that a low energy building fails on its weakest link, so it specialises in integrated solutions covering all aspects including daylighting and natural ventilation solutions.

Colt is dedicated to innovation and has a comprehensive design capability, including prototyping and testing facilities. We would welcome the opportunity to develop solutions to match your unique requirements.

Figure 1  
Latitude 51.7° N

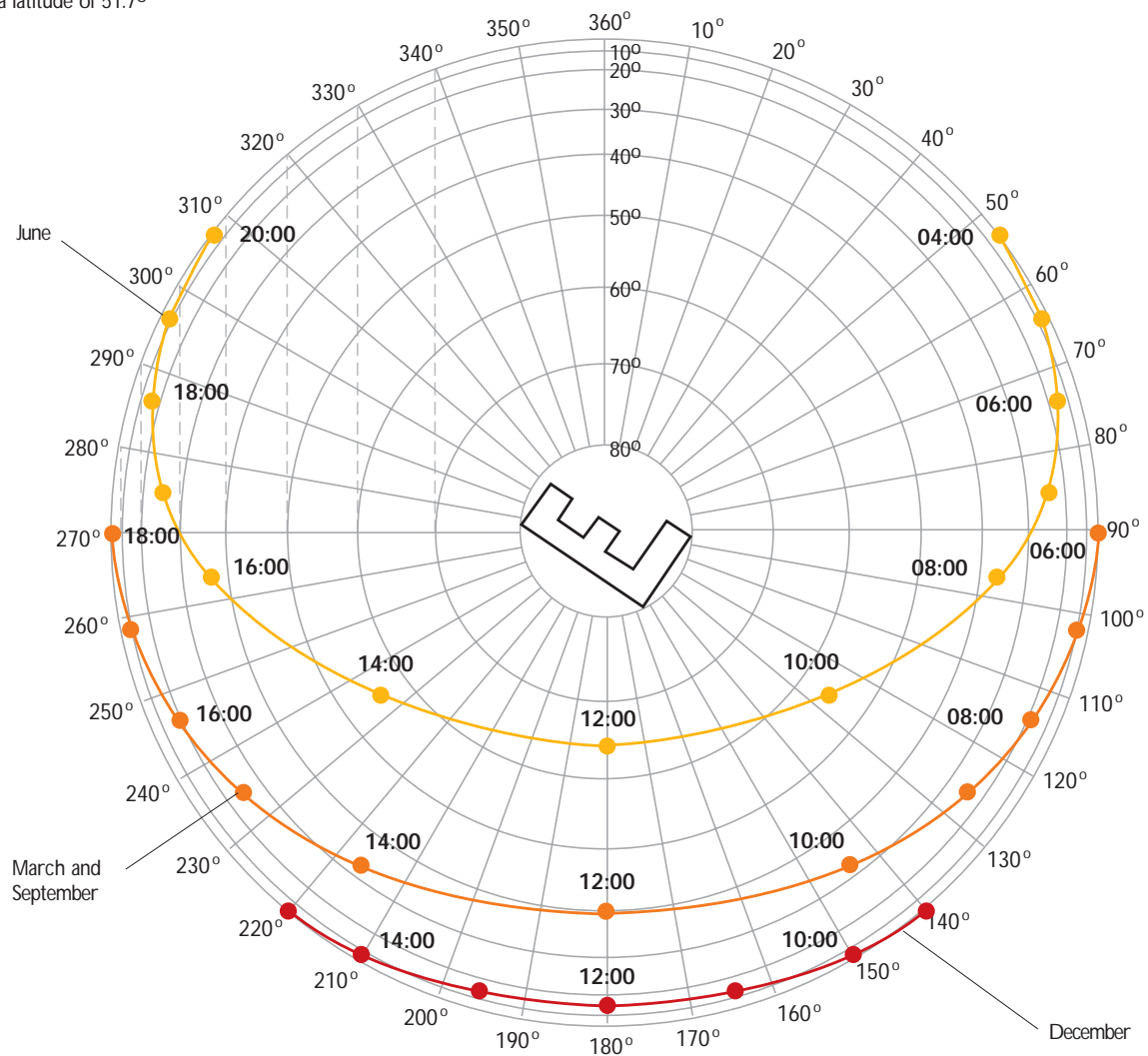




“The challenge is to maximise daylight entry into the work space whilst minimising the solar heat gain”

#### SUN PATH DIAGRAM

This illustration shows the azimuth and altitude of the sun for a latitude of 51.7° North



# Building Regulations

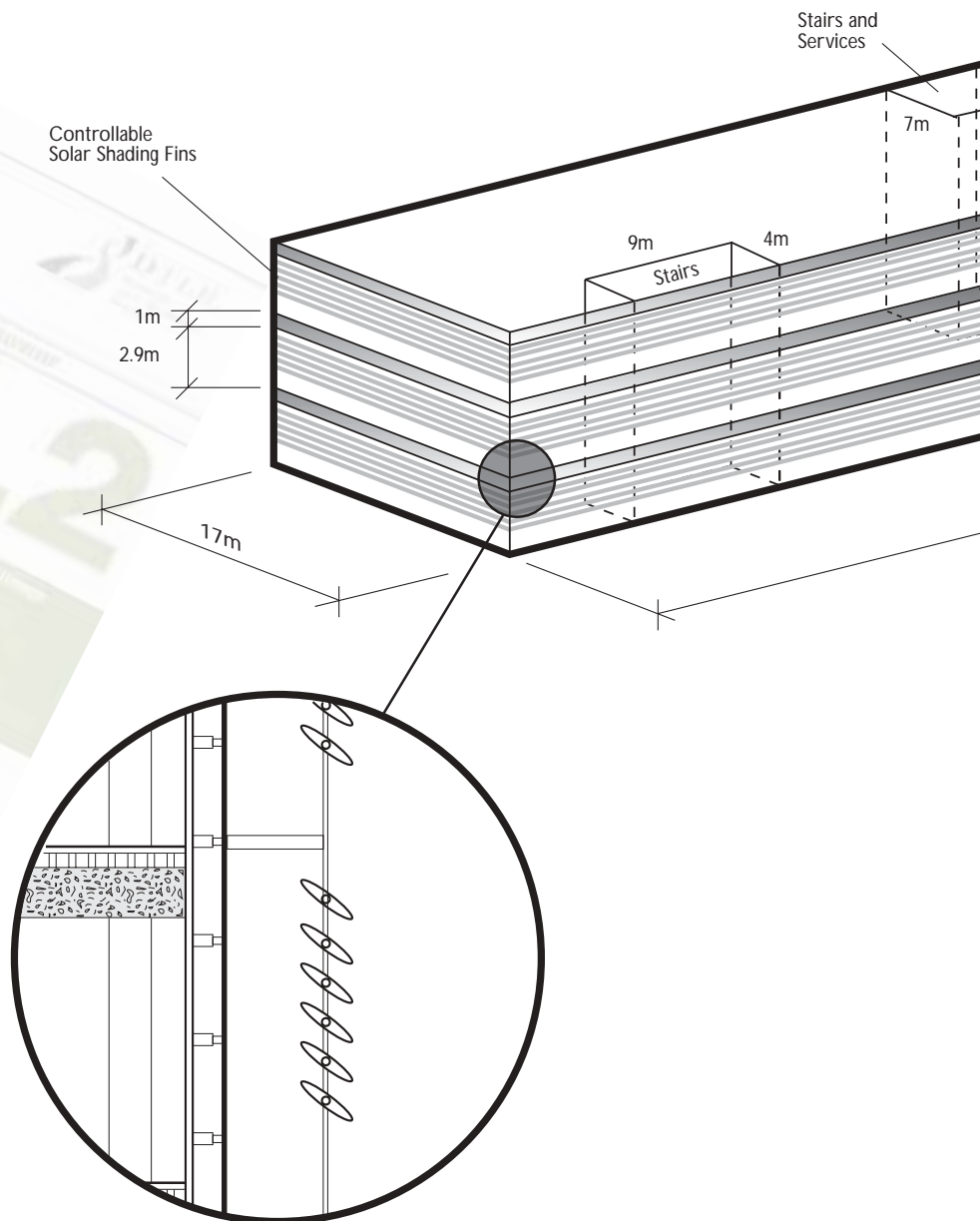
Approved Document L2 of the Building Regulations requires avoidance of solar overheating.

One approach to compliance is to show that the solar heat load to a defined floor area does not exceed  $25\text{W/m}^2$  on average between 07.30 and 17.30 in the month of July.

This can be an onerous requirement for a highly glazed façade where it is intended to maximise natural daylight entry.

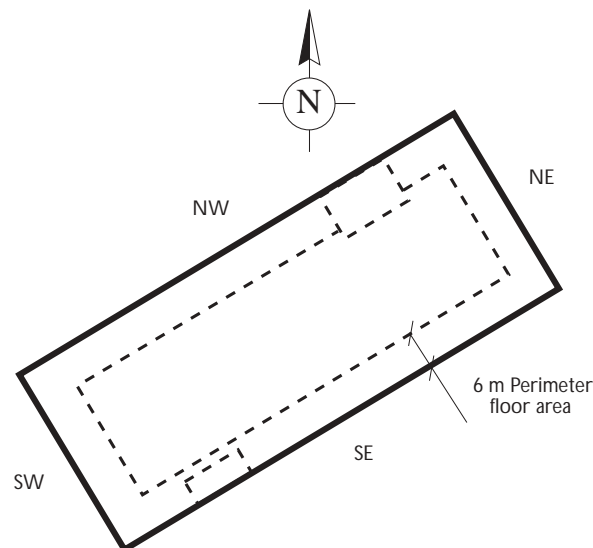
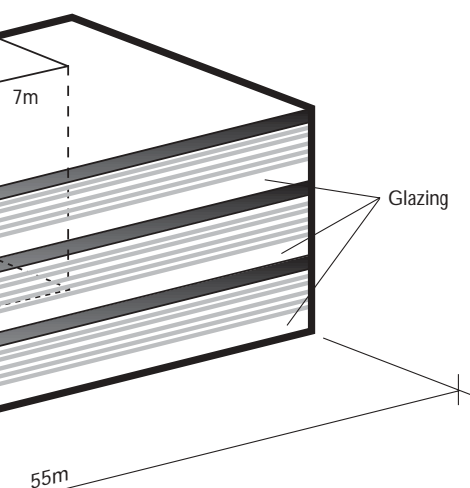
## Useful references

- (\*1) Average solar load for SW & SE elevation - Table H1 of Document L2
- (\*2) Average solar load for NW & NE elevation - Table H1 of Document L2
- (\*3) Correction factor for blinds and heat absorbing glass - Table H2 of Document L2
- (\*4) Frame ratio





Xscape, Milton Keynes, UK  
Decorative Solar C Shading Louvre was installed along side Colt Universal Louvre to provide natural ventilation



### WORKED EXAMPLE

The following example explains the use of solar shading for compliance with clause 1.23 and Appendix H of Approved Document L2:2002.

Take a typical modern fully glazed office block as shown, with an internal blind to prevent glare and heat absorbing double glazing. Assume the floor is fully open plan, then:

Perimeter floor area:  
 $A_p = 642\text{m}^2$

Glazed area (SW+SE):  
 $A_{g1} = 182.7\text{m}^2$       $q_{s1} = 198\text{ W/m}^2$  <sup>(\*)</sup>

Glazed area (NW+NE):  
 $A_{g2} = 188.5\text{m}^2$       $q_{s2} = 160\text{ W/m}^2$  <sup>(\*\*)</sup>

Using the equation H1 (solar load per floor area):

$$Q_{slw} = \frac{1}{642} (182.7 \times 198 + 188.5 \times 160) \times 0.66 \times (1 - 0.1)$$

(\*)                      (\*\*)

$$Q_{slw} = 62\text{ W/m}^2$$

This significantly exceeds the limit of  $25\text{ W/m}^2$ .

There are two basic options to decrease the solar gain. Reduce the glazing area or provide improved solar protection. Reducing the glazing area would mean that glazing would be limited to a strip only 1.2m high on each floor.

Improving the solar protection requires an improved correction factor of:

$$f_c = 0.66 \times \frac{25}{62} = 0.27$$

Using equation H3 of Approved Document L2 to calculate the shading coefficient of a system to meet  $f_c = 0.27$  gives:

$$S_c = 0.27 \times 0.7 = 0.19$$

Therefore shading coefficient must be less than 0.19

This can be achieved using the existing glazing and blinds with the addition of an external automatically controlled movable Colt Solarfin system.

(Note: although movable, the equation H3 is used since the automatic control ensures that the system is always in its optimum position. The regulations assume that a manually movable system is left in an inefficient position and performs worse than a fixed system).

# Solar C - Fixed Solar Shading

## INTRODUCTION

An important part of the design process is to consider when it is beneficial to protect glazing from the sun. If glare is controlled by other means, such as internal blinds, it can be useful to allow winter sun into the building to supplement heating and increase light levels. Solar C Brise Soleil are ideal for this, being configurable to provide any degree of protection.

A simple horizontal Brise Soleil is best suited to façades facing between South East and South West, but with careful design, Solar C can be effective on most façades.

Natural light entry and 'vision out' must play an important part in the overall design process.

Using our Sunfax computer program, and backed by a team of dedicated technical representatives, Colt can evaluate shading requirements on each elevation of a building and advise on the best configuration system to suit those needs.

## FIXED SOLAR SHADING

The Solar C system is a fixed louvre system that can be designed to meet the needs of any building.



Patented louvre clip is adjustable in increments of 15°

## THE SOLAR C LOUVRE BLADE

The Solar C blade is designed to be particularly effective at controlling solar heat gain while allowing a greater proportion of diffused light through the blade.

Six blade profiles are available varying in width from 100mm to 150mm.

A perforated blade is also available with a width of 110mm.

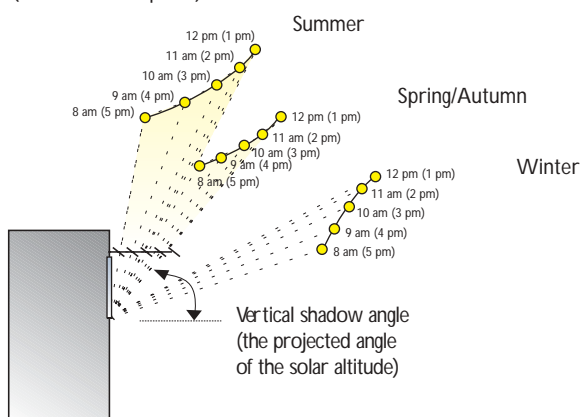
The pitch between the blades is normally set at 100 mm but this can be varied to suit the blade size and angle.

## SOLAR C PANELLISED SYSTEM

The Solar C is normally a continuous louvre system either mounted above or below fixed rafters projecting from the building. This will provide uniform light entry to the building.

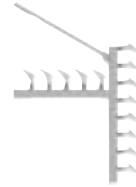
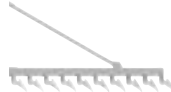
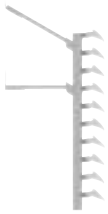
If a panellised system is preferred, then this is available with profiled end plates which can make a prominent feature to a building.

Figure 2 - South Facing (Northern Hemisphere)





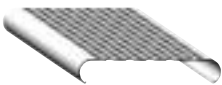
# Solar C - Assembly



## LOUVRE PROFILES



Type C100  
Max Span 1.65m



Type C100p  
Max Span 1.55m



Type C110  
Max Span 1.70m



Type C140  
Max Span 1.80m



Type C150  
Max Span 1.85m



Type C150g  
Max Span 2.00m

## FRONT FACIA



Type FP180r  
Attached to  
Louvre Clip



Type FP180  
Attached to  
Rafter

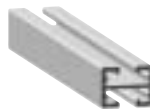


Type FP 90 N  
Attached to  
Rafter

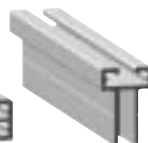
## RAFTERS



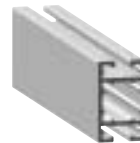
Type TR 15/30  
Fixing to  
Steelwork



Type TR 23/30  
Floating  
Intermediate



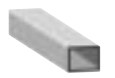
Type TR 45/30  
Cantilevered



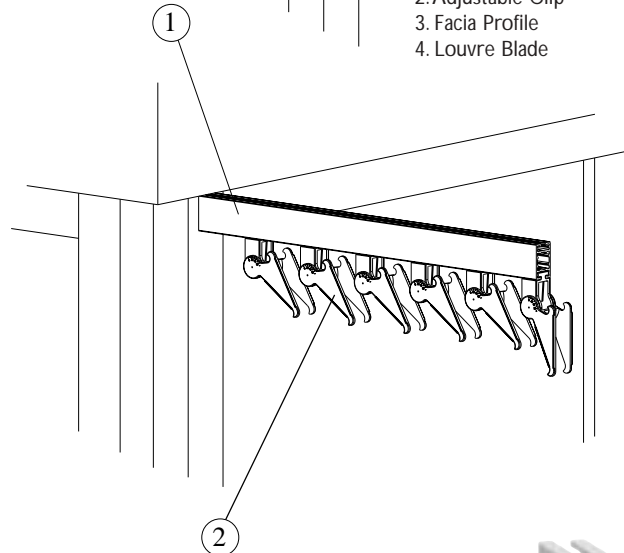
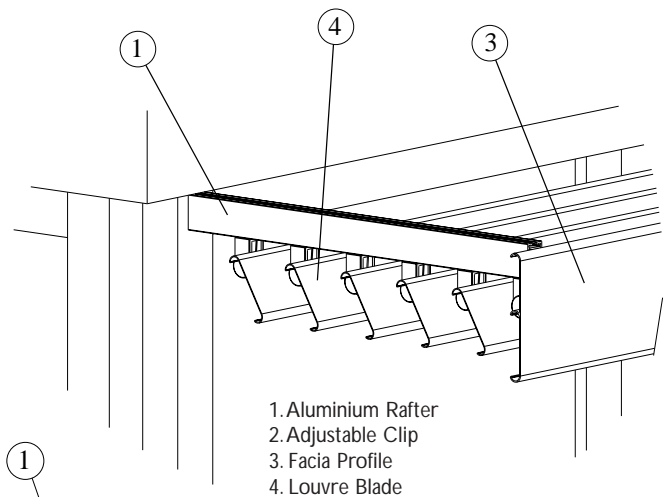
Type TR  
50/30



Type TR  
90/30



Bracing  
Strut  
20/20





Volkswagen's showrooms, like many in the automobile industry, projects a smart modern appearance with practical functionality



#### SUPPORT CLIP

Both a fixed and an adjustable clip are available. The adjustable clip allows complete flexibility of louvre and rafter angle. For visual and thermal performance the louvre angle can be changed on the rafter.



The patented louvre clip is adjustable in increments of 15°. The action of attaching the louvre blade fixes the angle.

Fixed angle clips are also available in 30, 45, 60 and 135°. Clips are available in either grey or translucent.

The plastic clip allows for thermal expansion of the blade and ensures a rattle free fixing.

#### SUPPORT RAFTERS

Five basic rafter designs are available. Their use depends on the fixing method and the loadings on the structure.

For any projections less than 1m, the rafter can be cantilevered from the building structure, assuming the windload is not excessive.

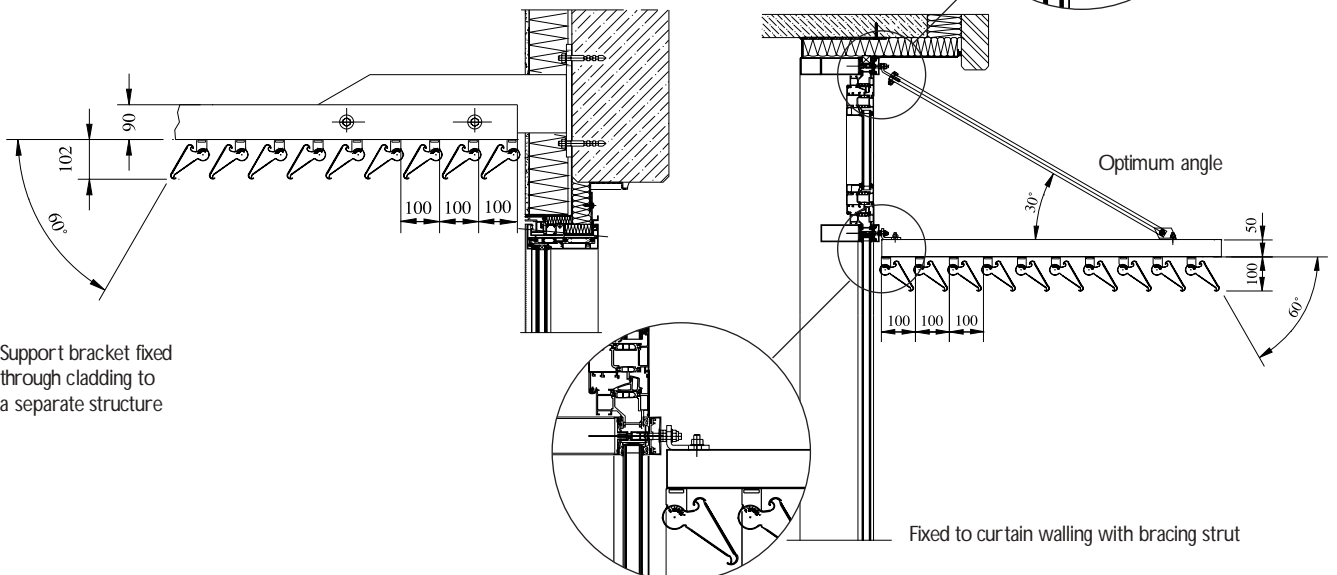
Maintenance walkways with kick plates and hand rails can be attached to the rafter to enable access for cleaning.

#### INSTALLATION

The installation should be carried out by Colt trained installers. With the continuous system, the louvres are sent out in break down form for on site assembly.

An adjustment in the louvre system can accommodate building tolerances of 10mm.

Particular attention is required to suitable fixing locations and the structural integrity of the fixing material. This should be considered at the early stages of the project.



Support bracket fixed through cladding to a separate structure

Fixed to curtain walling with bracing strut

# Solar C - Specification





Panelised system designed by R H architects, installed at the telecommunication company, Ionica, Cambridge.

Clissold Leisure Centre. Vertical hanging Solar C covering the glazing, which can be pivoted at an angle to facilitate easy cleaning of the glass behind.

**Manufacturer:**

Colt International Ltd  
New Lane Havant  
Hampshire PO9 2LY  
Telephone 023 9245 1111  
Fax 023 9245 4220

**Product Reference:**

Solar C type (select from)  
C100, C100p, C110, C140, C150, C150g  
(If applicable) Facia panel type (select from)  
FP 180, FP 180r, FP 90N

**Product Description:**

Fixed external solar shading system, for installation at (select) angle.

Louvre blades are attached to extruded aluminium box section rafters, with (select) variable/fixed macrolon clips in (select) translucent/grey.

The system is attached to the building structure with extruded aluminium bracing struts and stainless steel brackets.

**Material:**

Louvre blades, support brackets and mullions are manufactured from extruded aluminium alloy A1MgSi 05. Fixings are from stainless steel

**Blades pitch and angle:**

(select) mm @ (select) degrees.

**Louvre Projection:**

(select) Horizontal mm / Inclined / Vertical / Horizontal & Vertical / Inclined & Vertical.

**Finish:**

(select) Mill aluminium / Polyester powder to RAL / Anodised.



Canon Headquarters, UK.  
A bespoke variant of the Solar C Fixed Louvre was installed along the front façade and over the rooftop systems



BMW Education & Production Centre, Germany.  
In addition to controllable Solarfin, Colt Solar C was installed over the top of a Colt Azur rooftop system to prevent solar glare.

# Solarfin - Fixed and Controllable Solar Shading





Benenden Hospital, UK.  
Working with architects, John McAslan & Partners, Colt Solarfin was specified along the front façade which dramatically defines the whole appearance of the building.

Colt Universal Louvre was also installed for screening and ventilation

Left. Internal view looking out with very little impediment by the fins.



# Solarfin - Introduction

## INTRODUCTION

On façades from South East to South West, a fixed Solarfin system in front of the glazing will provide superior performance to a Brise Soleil system while allowing daylight entry and external views to be maintained.

On more Easterly or Westerly façades, any system will be a compromise due to the low summer sun angles needing to be controlled.

A controllable Solarfin system is ideal for such façades.

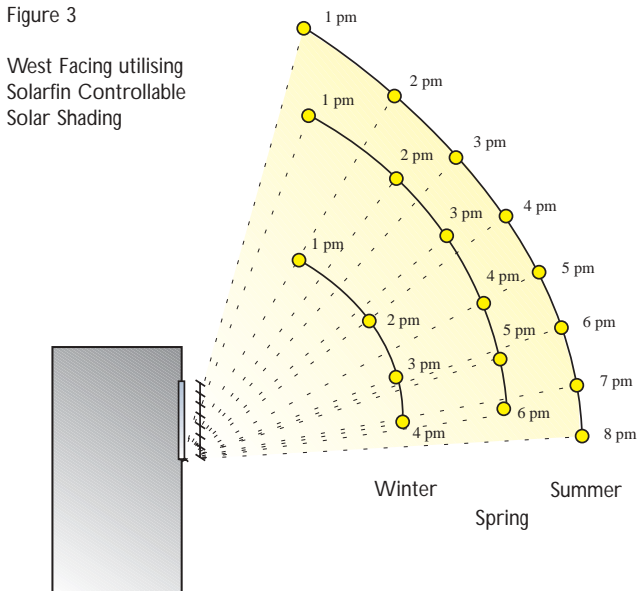
## CONTROLLABLE FINS

Although aesthetics play an important part within the overall design to enhance the building's appearance, functionality is critical, both for comfort and energy saving and to meet the legal requirements imposed by building regulations L2.

Controllable fins, mounted vertically in front of a window (Figure 3) will optimise solar shading and visibility, thanks to specially written computer software which controls the louvres to follow the path of the sun.

Figure 3

West Facing utilising Solarfin Controllable Solar Shading





Benenden Hospital, Kent



West Coast Rail Traffic Control Centre, Saltley

Controllable fins reduce the likelihood of 'overshading' or 'undershading' that frequently happens with fixed solar shading and will result in the optimum shading angle (Figure 4).

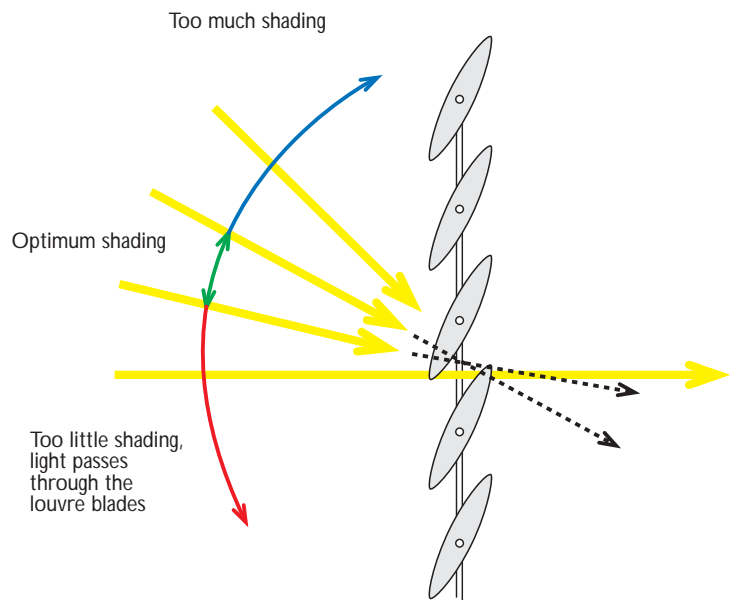
On dull days, light sensors can operate to fully open the fins to allow the occupants maximum natural daylight and vision to the outside at all times.

Controllable solar shading is also effective when fitted to glazed rooflights.



Adshel, London.  
Vertical fixed and controllable shadometal fins

Figure 4



# Solarfin

Cambourne Business Park,  
Cambridge, UK.  
Designed by architect Aukett  
Europe, Colt worked closely with  
the contractor Alfred McAlpine  
on building 2020 within this  
business park.

Colt supplied Solarfin type  
CEL300/50 and CEL 480/80  
attached to structural steel  
columns at 6m centres.

Colt Universal Louvre was also  
installed for natural ventilation  
of the plant rooms





Tate Britain, London, UK.  
Colt controllable Solarfin hollow section aluminium fins installed on top of Colt Azur rooflight systems

#### COLT SOLARFIN

Colt Solarfin is a vertical or horizontal system that can be fitted at any angle.

Special features include its striking bold appearance and its capacity to reduce solar heat gain and to control the amount of daylight within a building.

Additional benefits are that, when closed, solarfin provides substantial security and can help reduce winter heat loss.

The Colt Solarfin system comprises a series of extruded aluminium fins mounted onto a support frame. The fins may be fixed at any angle and can rotate under motorised or thermo-hydraulic control.

Fins are available as one piece extrusions in widths up to 400mm and as multiple clip together extrusions in widths up to 1050mm.

Spans can be up to 6m without intermediate support and up to 10m with intermediate bracing rods.

Fabricated and perforated fins are also available.

Colt has a wide range of standard profiles but bespoke profiles and designs can be developed on larger projects.

All principal components are manufactured from extruded aluminium alloy type 6063 T6 with stainless steel fixings.

Controllable fins can pivot through 360° when utilising the new Colt PIA system and can be controlled by astronomical data operating the actuators to track the path of the sun.

#### SUNFAX

Sunfax is a specially designed computer program that evaluates the effectiveness of a solar shading system. With this program Colt can assess a system design and provide a bespoke solution to meet all aspects of your project.

Backed by an experienced technical support team, Colt can work from the earliest stages of your project to design an aesthetic, high performance system to meet all your requirements.



BMW Education & Production Centre, Germany.  
Over 1000m<sup>2</sup> of controllable solarfin controlled by CCS 2000 was installed along the front façades.

In addition, fixed Solar C was installed over the top of the Colt Azur rooflight system with natural smoke and heat extract ventilators

# Solarfin - Profiles

## STANDARD RANGE

CEL 60/20



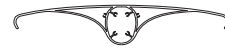
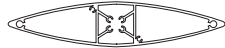
CEL 120/20

CEL 150/34



CEL 200/34

CEL 250/40



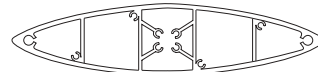
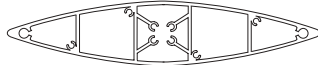
CHL 250/40

CEL 300/50



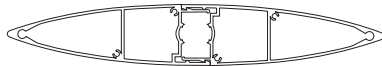
CEL 350/55

CEL 400/60



CEL 400/80

CEL 480/80



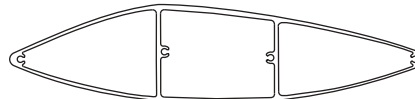
## SPECIAL PROFILES

120/19.6



265/35

120/15



280/80

125/22

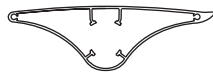


140/20



300/35

154/50



165/27

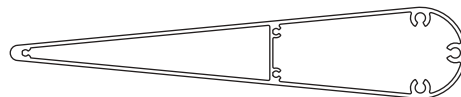


300/50

165/30



180/20.5



300/60

220/49



300/60

240/30



241/39



330/38


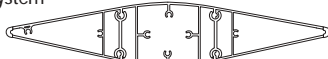


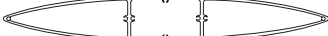




250/25




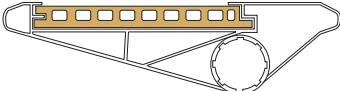
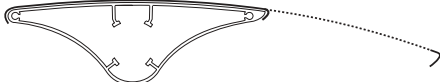

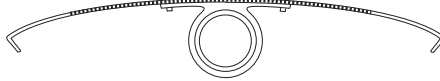

NOT TO SCALE



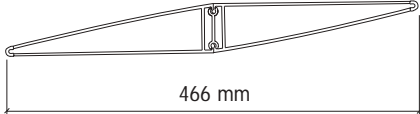
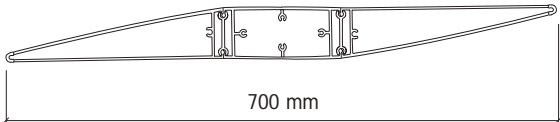
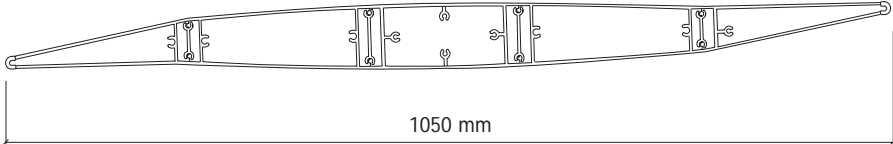
SPECIAL PROFILES CONTINUED

330/70		3 piece system		410/86
400/84		3 piece system		480/86
416/84				500/65
480/70				660/65
480/80		3 piece system		

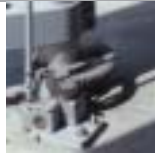
BESPOKE PROFILES

Perforated			Terracotta Clay
Perforated 154/50			Combination Louvre with Glass
Perforated 250/50			Acrylic Blade

LARGE BESPOKE PROFILES

466/64	
700/70	
1050/70	

# Bespoke Profiles & Solarfin Specification



UTZ Offices, Berlin, Germany.  
(Also front cover shot)  
Bespoke vertical solar shading  
fins that can be manually altered  
to control the level of internal  
lighting

Shadovoltaic Louvres, which  
incorporate photovoltaic cells,  
were also installed over the main  
entrance hall and can generate  
over 15kWp, equating to an  
energy output of approximately  
7500 kWh per year

Please refer to Colt's Shadoglass  
leaflet for further information on  
glass and photovoltaic louvres.

SD Worx, Germany

Controllable perforated Solar fin





Natural History Museum, London.

Between the Colt glass façade and walkway of the stunning South façade is a bespoke, controllable fin, which is half perforated to provide additional daylight when in the closed position

**Manufacturer:**

Colt International Ltd  
New Lane Havant  
Hampshire PO9 2LY  
Telephone 023 9245 1111  
Fax 023 9245 4220

**Product Reference:**

Colt Solarfin type  
(select from standard range)

CEL 150/34, CEL 200/34,  
CEL 250/40, CEL 300/50,  
CEL 350/55, CEL 400/60 and  
CHL 250/40,

or telephone Colt to discuss your special requirements.

**Product Description:**

(select) Controllable / Fixed external solar shading system, designed to reduce solar glare and solar heat gain.

Extruded aluminium fin profiles are designed to prevent or reduce direct radiation through windows in summer, while keeping visibility through windows as clear as possible.

**Material:**

Fins and rafters are manufactured from extruded aluminium alloy 6063 T6. Fixings are from stainless steel.

**Fin pitch and angle:**

(select) mm @ (select) degrees.  
(Select angle for a fixed system only).

**Finish:**

(select) Mill aluminium / Polyester powder to RAL / Anodised.

Stainless steel components to be self-finished if applicable.

OSZ, Eisenhüttenstadt, Germany.  
Colt perforated controllable Solarfin has been installed to prevent glare and excessive solar heat gains for the students at this school



# Control Systems

## TOTAL CONTROL

Although fixed solar shading performs well on a South facing façade, performance is dramatically reduced on a East or West facing façades.

To overcome this problem, a controllable system is required. Sun tracking louvres follow the path of the sun, making sure the solar shading system is always at its optimum.

The control system can also be programmed to communicate with the louvres on dull or overcast days. If clouds pass over the building, the louvres can automatically open to maximise daylight entry and then revert back to the optimised position.

## PIA (HIDDEN ACTUATOR) SYSTEM

The innovative PIA system is a mullion integrated drive system which is available for the Solarfin range.

Large exposed actuators are no longer required since the PIA system provides central pivoted control within the mullions.

## PIA SYSTEM

Each control mechanism within the mullion can drive the louvres from 0° to 360°. This enables greater flexibility of application for light reflection or even cleaning for example.

Unobtrusive, compact façades can be created which are equally suited for both vertical and horizontal applications, with almost silent running operation when the fins are moving.

Installation is very quick and simple as all components are supplied fully pre-assembled. Also, the mechanical integrity of the system is assured, the louvres are individually fixed into their bearings so the likelihood of structural failure is very much reduced.

The PIA system also integrates with Colt's Shadoglass range of products

## CONVENTIONAL ACTUATION



## NEW PIA SYSTEM



The control mechanism is discreetly contained within the mullion instead of hanging externally as shown above





Crosby Leisure, UK.  
Specially design fixed twin fin system.



Conix, Liverpool, UK.  
Designed by architects Austin Smith Lord, the Conix building incorporates a fixed Solarfin system to prevent solar heat gain and glare to the front offices and to visually enhance the overall building

#### THA - THERMO-HYDRAULIC

There are three control methods available for Colt Solarfin systems;

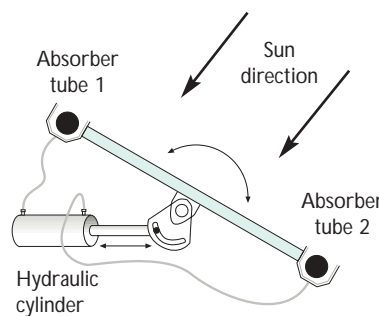
Soltronic

CCS 2000 and

Thermo Hydraulic (THA)

The THA is a thermo-hydraulic control system which is self-powered by the sun using the heat generated to expand or contract fluid within a tube.

This system requires no external power, absorber tubes, enclosed by mirrors, detect the position of the sun and force an hydraulic cylinder to open or close the louvres.



When absorber tube 1 gets hotter than tube 2, gases in the centre tube expand which hydraulically controls the cylinder rod, the louvre will rotate until both tubes are in equal alignment with the sun.

#### SOLTRONIC

The Soltronic is a new solar control system designed and manufactured by Colt, ideally suited for small to medium sized projects.

The microprocessor has been designed to respond to external weather conditions and automatically calculate the position of the sun, adjusting the position of the louvres accordingly.

The Soltronic is in effect, a simplified version of the CCS 2000 module and can control up to ten actuators in any single zone.

The Soltronic can be operated manually or from a building management system via a 0 to 10 voltage signal.

For example, 10 volts - louvres would open fully at 5 volts - louvres go to half way position, 0 volts - louvres close.

#### CCS 2000

The CCS 2000 system provides accurate solar control and is ideally suited to larger projects.

The position of the sun is continually calculated by its intelligent processor while internal temperature and lighting sensors send signals to the processor, altering the position of the louvres in conjunction with the present readings.

The CCS 2000 is very flexible with a variety of operating modes including weekend programming, storm shut down and even a cleaning position.

Remote operation is also available via an internal modem interface.



Soltronic Controller



Colt CCS 2000 Controller

## COLT SERVICE

Part of the Colt Group of companies, Colt Service offers a comprehensive range of maintenance packages incorporating the maintenance and repair of all building services equipment including non Colt products.

Colt Service provide a 24 hour, 365 day emergency cover as standard.

## MAINTENANCE

Colt Shadometal systems are designed to be virtually maintenance free, although regular cleaning of the fins with a mild detergent is recommended. For obvious reasons, abrasive cleaning agents and wire brushes must not be used. Periodic inspection of moving parts is also recommended.

