

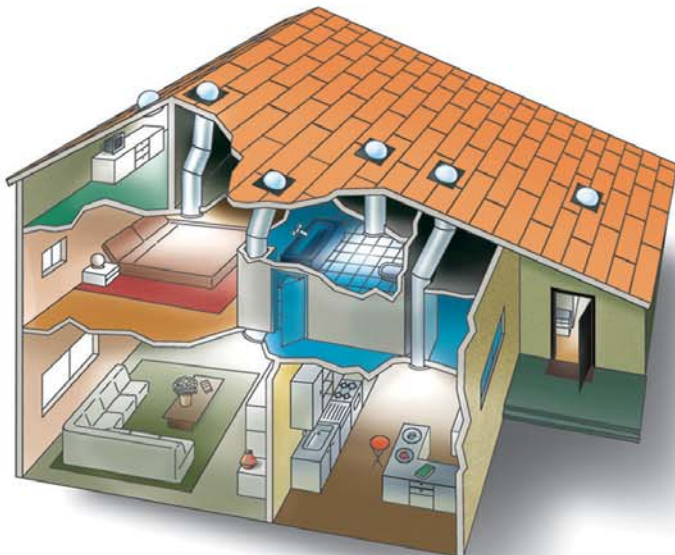
Humans well being
Environment protection



SOLARSPOT®

The tubular skylight

that naturally brightens the darkest areas of buildings
and wherever no windows are available



2003

BATIMAT - Paris
Gold medal
for the innovation

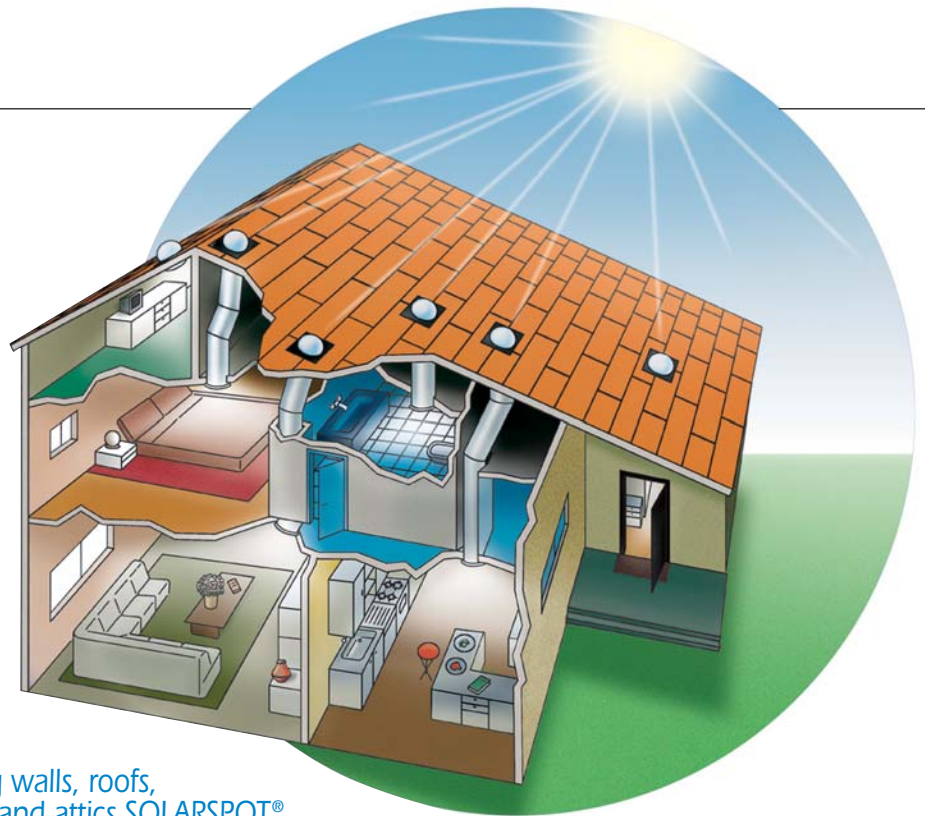


2006

AVIS TECHNIQUE

Technical advice
by CSTB - Paris, France
Centre Scientifique
et Technique du Bâtiment





Crossing walls, roofs, ceilings and attics SOLARSPOT® reaches any enclosed area of the house with its natural daylight such as: garrets, passages, blind baths, cellars and the areas poorly enlightened by the standard windows

The natural sunlight for all enclosed areas



As we know, the natural sunlight is an indispensable source of life for the living organisms; for the man, however, it plays various roles with remarkable psychological effects not exclusively bound to the quality of the vision of individuals, but for their well-being as well: the feeling of a well aired place, the perception of the true natural colours, the regulation of the biological cycles. The abstention from its benefits for long periods is the principal cause of some depressing pathologies.

the diurnal abuse of electrical lighting increase a lot air pollution and is a primary reason for electric network crisis due at unbalanced demand of energy what a dramatic non-sense in summer hot time, just when is available more natural sunlight to employ electricity also for cooling overheated space by heat dissipated by electric lamps!

As sunlight direct and diffuse is an irreplaceable source, the possibility of conveying it into windowless areas plays today a role of utmost importance to improve our life conditions.

SOLARSPOT® is a special skylight; its dome very transparent, normally supported by flashing placed on the roof of the building, is equipped with an optical device, RIR® , that redirect light inside a super reflective tubular duct that guide it to the emitting surface (diffuser) placed, tightly, at opposed side.

This is possible when it rains or it is cloudy, both in winter and in summer, from sunrise to sunset and also in clear days when the sun shines. It is sufficient to set the capturing device so that it can see the whole sky (zenithal position) and therefore be reached from the light reflected from the sky and coming from the sun; the super-reflective tubular duct carries the light to many meters distance. It does not make miracles but more light it sees, more light it gives.

Its RIR® device has the simple magic effects of the prismatic lenses; it is preset to intercept and redirect like a funnel, all beams of light coming from the whole vault, into the duct, into the reflective and conveying pipe, catching even the lowest rays on the horizon.

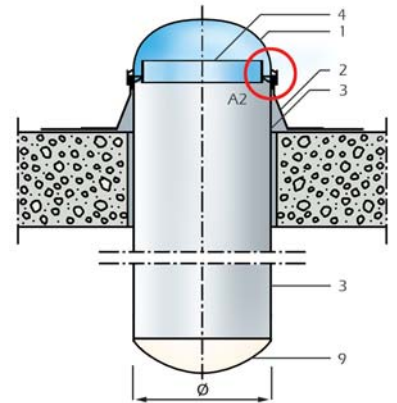
All the light energy coming from the sky and the sun reaches the diffuser except the very small lost fraction absorbed by the dome the diffuser and that lost in the pipe, not reflected at each stroke (0,5%).

No other system in the world with light intercepting device can also recover the precious part of indirect light coming from North.

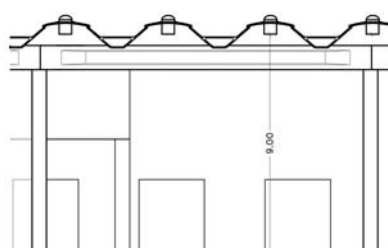
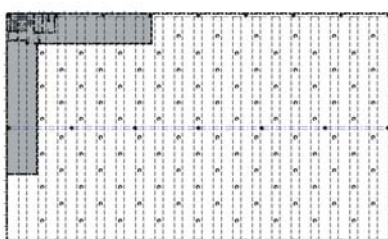
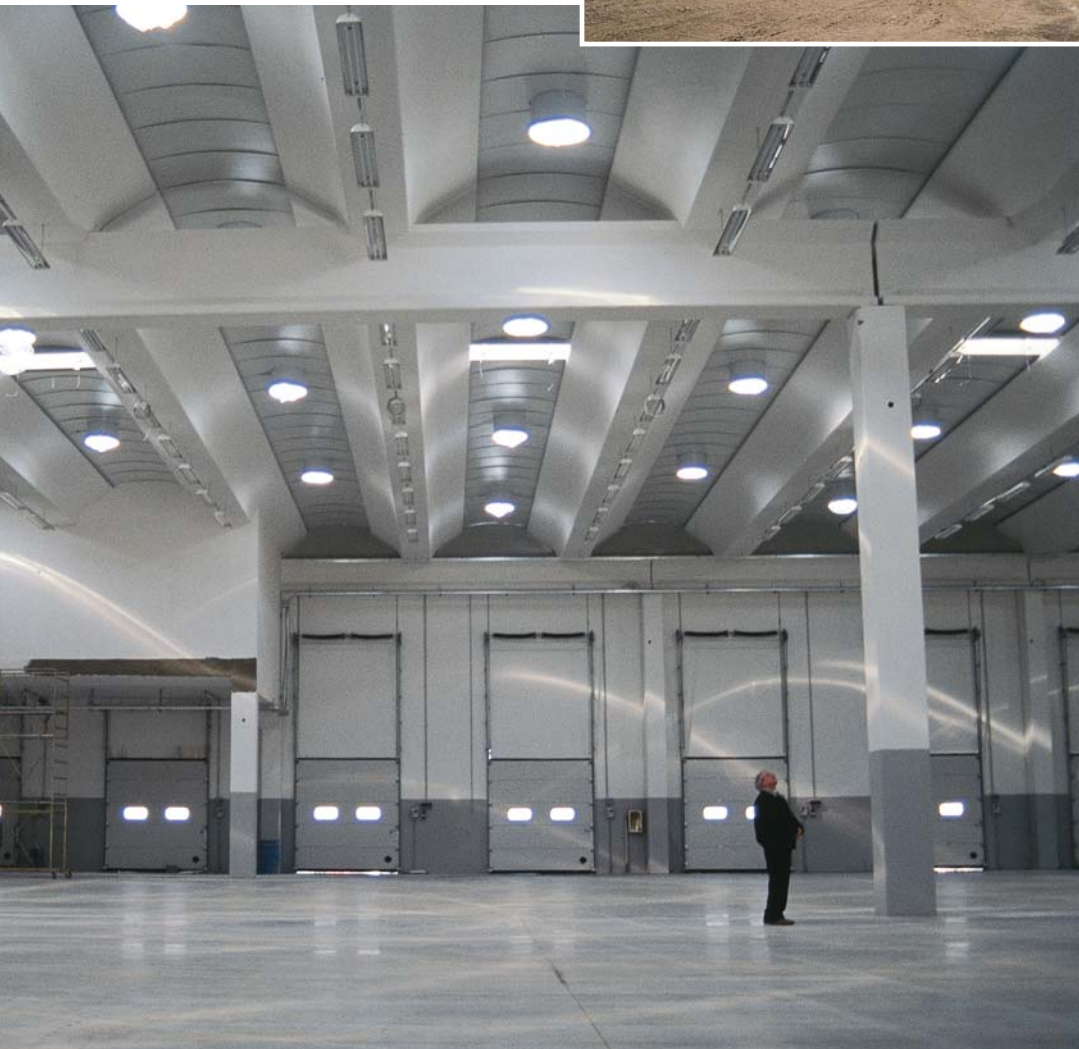
No other system has such a high transparent and effective dome. SOLARSPOT® lets in much more light than any other tubular skylight device. In such a high technological system every component must perform at its best. For the duct SOLARSPOT® employs the new material Vegalux built by Solar Project: it is the most reflective mirror the invisible spectral range, without UV effects and infrared heating contribution, ever realized in the world. Vegalux is the synthesis between the unique features of the reflective multi-layer Daylighting film DF2000MA -3M and the 50 year experience on aluminum technology of our researcher. With Italian taste and style it enlightens the world better and more naturally respecting the environment; a unique way for lighting without heating.

Case study available for industrial and commercial buildings

EUROSPED, Tavazzano (Italy) 4600 sq.m. lighted by n°105 Ø 650 lamp Solar-work and n°5 Solarspot Ø 375 and n°6 Ø 530 long ducts version - December 2001.



Solarspot Lamp kit

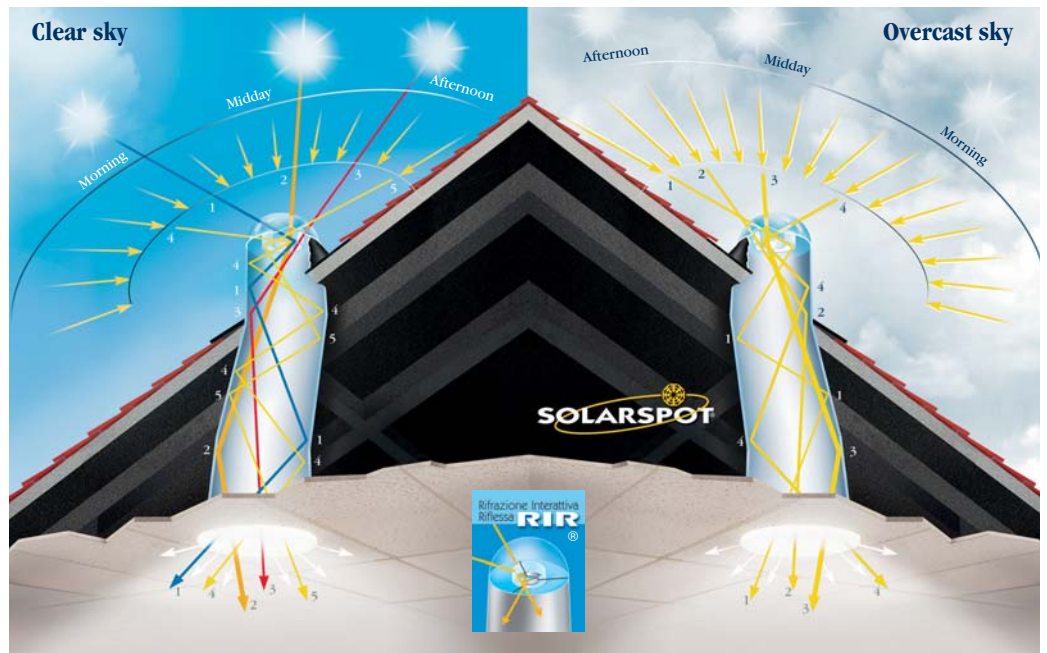


Ø 900 - Arthelio Project by Ricerca & Progetto

Capturing, redirectioning and conveying of diffused and direct light

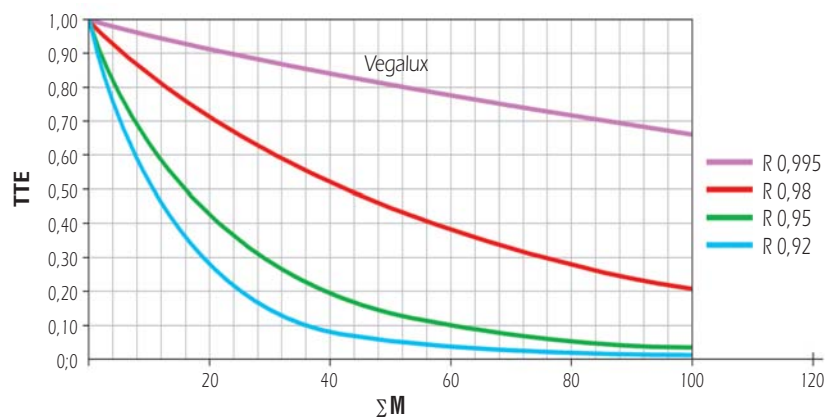
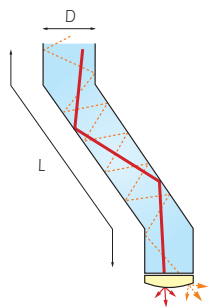
The direct sunlight and the light diffused by the air and the clouds in the atmosphere coming by every direction from celestial vault intercepted by RIR® device, are reflected or refracted, changed to more favourable angles towards the walls of the pipe and then, after many rebounds, reaches the diffuser lighting the dark spaces by magic. The favourable RIR® refraction affect also the diffused light coming from North. The light beams that directly enter inside the tube bounce on the walls, and together those redirected by the RIR® supply natural solar light at any enclosed area.

The combination of dome, RIR® and reflective walls of the conveyors act as an "optic fun-nel": all light beams bounce in the duct till they reach the diffuser with less but longer rebounds thanks to the magic RIR® and supply, more lighting energy to dark space.



Project design procedure, by average daylight factor FLDm, according CIE TC3-38, TTE guide line, and Avis Technique - report 7 - Solarspot case

- Define A, Sq. m, of floor space to be lit
- Define the course of the duct from the roof exit to the diffuser, and straight tubes
- Define the transmission efficiency of the tube as a function of the optical equivalent length due at real course of duct, assuming as unitary length a modulus M^m the value $M=D$. This make possible to add lengths of straight tubes to experimental one of elbows (see examples in yellow table).
- Approximate values of the TTE, for Vegalux tubes (overcast sky - entry angle of light 30°) listed in white table, also in diagram together less reflective tubes on the market.



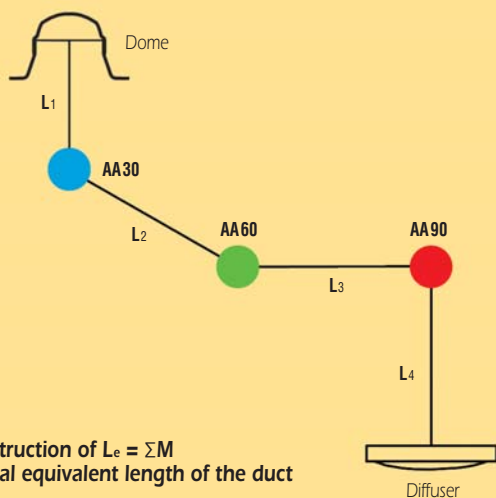
FLDm%	Lighting surfaces m ²					ΣM	D	Vegalux duct					ΣM	Lighting surfaces m ²	FLDm%
	0.5	1	1.5	2	3			0.5	1	1.5	2	3			
I_{0,5} lux	62,5	125	187,5	250	375										I_{0,5} lux
L_e/m	Lighting surfaces m²							Lighting surfaces m²						L_e/m	
1	9.2	4.6	3.1	2.3	1.5	4	250	530	1.9	42.7	21.4	14.2	10.7	7.1	1
	21.1	10.5	7.0	5.3	3.5	2.67	375	650	1.5	64.1	32.1	21.4	16.0	10.7	
5	8.7	4.3	2.9	2.2	1.4	20	250	530	9.4	40.9	20.4	13.6	10.2	6.8	5
	20.1	10.1	6.7	5.0	3.4	13,1	375	650	9.4	62.2	31.1	20.7	15.6	10.4	
10	8.0	4.0	2.7	2.0	1.3	40	250	530	18.9	39	19.5	13.0	9.7	6.5	10
	18.9	9.4	6.3	4.7	3.1	26.7	375	650	15.4	60.3	30.2	20.1	15.1	10.1	
15	7.4	3.7	2.5	1.9	1.2	60	250	530	28.3	37.7	18.9	12.6	9.4	6.3	15
	17.9	9.0	6.0	4.5	3.0	40	375	650	23.1	58.5	29.2	19.5	14.6	9.7	
20								530	37.7	36.5	18.2	12.2	9.1	6.1	20
								650	30.8	56.6	28.3	18.9	14.1	9.4	
25								530	47.2	35.2	17.6	11.7	8.8	5.9	25
								650	38.5	54.7	27.3	18.2	13.7	9.1	

Resolved table for the areas of Bologna (Italy) 44°20' North illuminance at ground 19.000 lux minimum 2776 h/year (60% of daylight time) Satel-Light - Meteosat statistical data. Example: of yellow table: diameter 375 mm; ΣM = 35; FLD m = 1; L_e = 13.1 m Area of 9.0 ÷ 9.4 sq.m should be lit by each unit

Angle adapters

the equivalent modular length of elbow expressed as multiple of 1M=1D of each diameter, shows experimentally that measured efficiency values of elbow are equivalent to higher lengths efficiency straight tubes - according CSTB - report n°7

Shape		M:ø 250	M:ø 375	M:ø 530	M:ø 650
	Until 30°	4,8	3,5	2,3	1,4
	Until 60°	9,6	5,7	4,5	2,8
	Until 90°	12,8	7,2	5,8	3,7
	2 x 30°	8,7	3,8	2,5	1,5
	2 x 90°	12,9	6,8	7,0	3,6



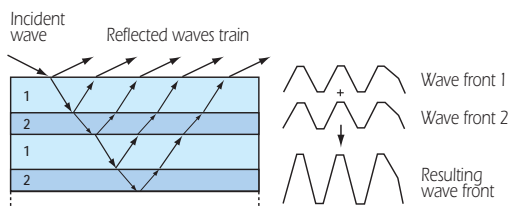
Construction of $L_e = \Sigma M$ optical equivalent length of the duct

D - Diameter (mm) - L - Length (m)

D Li - M	250		375		530		650	
	Li	M	Li	M	Li	M	Li	M
L1	1	L/D 4	1,5	4	2	L/D 43,8	0,5	L/D 0,8
L2	2	L/D 8	1	L/D 2,7	0,5	L/D 0,9	1	L/D 1,5
L3	2	L/D 8	2,5	L/D 6,6	4	L/D 7,6	3	L/D 4,6
L4	1,5	L/D 6	2	L/D 5,3	0,5	L/D 0,9	4	L/D 6,1
AA30	0,30	4,8	0,30	3,5	0,40	2,3	0,40	1,4
AA60	0,60	9,6	0,60	5,7	0,80	4,5	0,80	2,8
AA90	0,60	12,8	0,60	7,2	1,20	5,8	1,20	3,7
Σ M		53,2		13,1		25,8		20,9

Vegalux - rolled aluminum alloy hardened to assure the maximum elasticity and solidity to the duct, matched with exclusive plating procedure through calendaring and stretching of multi-layer super-reflective **3M Daylighting DF2000MA Film**. Maximum flatness; specular reflectance in the visible range (400-700 nm), close to its theoretical peak (R~99.5%), without chromatic distortions for the best true color rendering. Vegalux does not reflect the infrared long waves and makes the solar heat gains of SOLARSPOT negligible. Unlike other bilaminates Vegalux does not employ silver film and therefore is not affected by the aggressive action of the condensate and by the risk of separation and corrosion of the reflective layer. Vegalux is produced in coils with net width of 1220 mm and it allows to realize pipes of length up to 1200 mm

Natural light reflection model on a packet of transparent films (multi-layer film) like R-99,5% - Vegalux **3M Daylighting Film - DF2000MA**



TTE - Vegalux tube transmission efficiency (CIE-overcast Sky) versus length duct (L-m) and diameter (D-cm)

D	TTE 25	TTE 37,5	TTE 53	TTE 65	TTE 90
L					
0,25	1,00	1,00	1,00	1,00	1,00
0,5	0,99	0,99	1,00	1,00	1,00
1	0,98	0,99	0,99	0,99	1,00
2	0,97	0,98	0,98	0,99	0,99
3	0,95	0,97	0,98	0,98	0,97
4	0,93	0,95	0,97	0,97	0,98
5	0,92	0,94	0,96	0,97	0,98
6	0,90	0,93	0,95	0,96	0,97
8	0,87	0,91	0,94	0,95	0,96
10	0,84	0,89	0,92	0,94	0,95
12	0,82	0,87	0,91	0,92	0,94
14	0,79	0,85	0,89	0,91	0,94
15	0,78	0,84	0,89	0,91	0,93
16	0,76	0,83	0,88	0,90	0,93
18	0,74	0,82	0,86	0,89	0,92
20	0,71	0,80	0,85	0,88	0,91
25	0,66	0,75	0,82	0,85	0,89



The super-reflective material covering the inside of SOLARSPOT® pipes assures sunlight even at wide distances from the capturing device

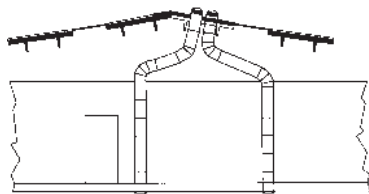




Case study available:
 CTL - Bologna (Italy).
 N° 66 Solarspot 530 lighting naturally
 1500 sq.m refrigerated warehouse
 for milk and milk by-products.
 Terrance (SATO) aluminium seamless
 flashing - June 2005.



N. 14 Solarspot Ø 650 each one made
 by 22 tubular angled sections,
 naturally light 560 sqm of the enlarged
 workshop FRE.TOR in Puos D'Alpago,
 Belluno (Italy). Sato aluminium
 seamless flashing - December 2002.



Environment Park
 Torino (Italy).
 N° 9 - special design of Solarspot
 for the natural lighting of kitchen and restaurant, both underground.
 Design arch. S. Dotta. Terrace (SATO), seamless aluminium flashings. 2003.



Underground

N.15 Solarspot Ø 250 enlighten
 natural tuff caves restyled as Fitness Centre
 in a farmhouse by Monopoli (Ba) Italy.
 June 2002.



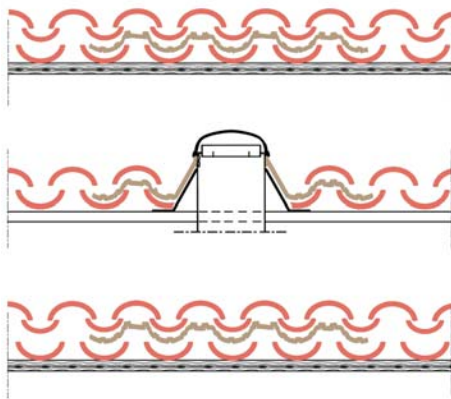
Universal flashing for any kind of tile



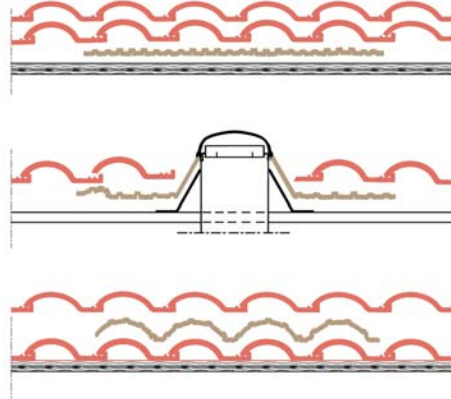
Example of roof exits by SOLARSPORT® and PROTEO®

A = Top
T = Cross
B = Bottom

Canal-tile



Monocanal-tile



Round and square diffusers



Prismatic



Vision



Fresnel lens



Lamp diffuser



Darkening curtains

El-bow, angle adapter 0-90° and elongation tubes



COMPONENTS OF PRE-ASSEMBLED KITS

dome with RIR®, diffuser, pre-assembling ring, starting tube (dome), room-tube (diffuser), with dress ring Ready to be joined to flashings:

quick and right installation



∅ standard mm: 250 (10") - 375 (15") - 530 (21") - 650 (25")

With electrical accessories

Solar-Dimmer

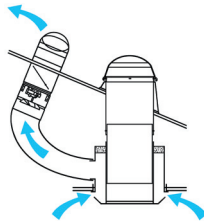
Controls of the amount of light from SOLARSPOT® adjusting it at level you wish, by the ease of an electric switch. Negligible lost of light when baffle totally open



Available for all standard diameters

Solar-Luce*

Electric night lamp kit



Solar-Fan

Ventilation kit

SOLAR-ATTIC

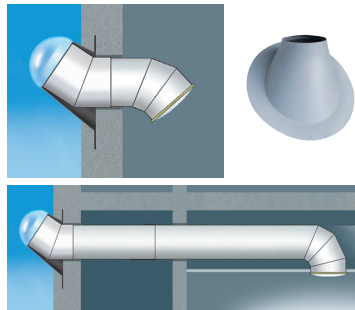
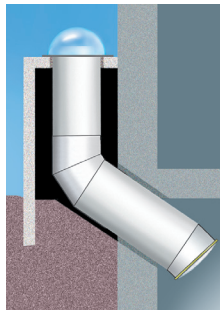
Ideal to enlighten garrets and lofts



SOLAR-WALL

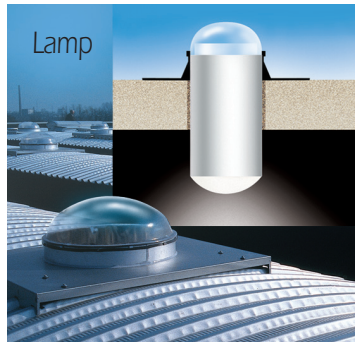
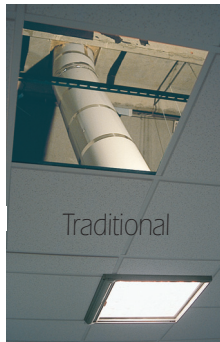
When areas can be reached from ground and wall. SOLARSPOT® can convey light horizontally...and uphill. Only possible by elbow and tubes made of

VEGALUX R = 99,5%



SOLAR-WORK

For the large surfaces of new buildings and restyled ones, SOLARSPOT® provides natural light, but not heat.



CSTB - CENTRE SCIENTIFIQUE ET TECHNIQUE DU BATIMENT - PARIGI
Domanda ATEC n° AC 2004339 - 6 - D

CERTIFICATES AND EXPERIMENTAL RESULTS FOR THE AVIS TECHNIQUE

1 - Durability test of 3000h en WOM C165 (Atlas, BST=60°C) on the brown watertight sheet associated with a 250 mm diameter SOLARSPOT® system. Test report CSTB nr. BV05-491 dated 26th July 2005.

2 - AEV tests on pre-assembled kit of the 530 mm diameter SOLARSPOT® system "lamp" type. Test report CSTB nr. BV05-441 dated 7th July 2005.

3 - Shock test on the dome of a 250 mm SOLARSPOT® system. Test report CSTB nr. BV05-440 dated 7th July 2005.

4 - CSI - type approval - certificate 1409/05 - CSI Report - DC01/640 F 05 dated 13/09/2005. EN 13501-1 : 2002 ; PROTEO® mix 5682 - LAC 5682 MA 010/IH - EURO-CLASS E

5 - CSI - type approval - certificate 1409/05 - CSI Report - DC01/648 F 5 dated 13/09/2005. GALPRO 10CF - EUROCLASS E

6 - Calculation of thermal dispersion through the light ducts. Thermal study report. CSTB - 05-027 Affair DER/HTO 2005-140-FL/LS dated 1st August 2005.

7 - Characterisation of the luminous performance of the pre-assembled kit of 250 mm., 375 mm., 530 mm. and 650 mm. diameter SOLARSPOT® systems. Luminous balance data present in the tables at the end of the technical dossier. Test report CSTB nr. EN-ECL.05.02C dated 28th June 2005.

8 - Test report nr. CPM/05-0047 Optical characterisation in transmission and reflection of the elements of the SOLARSPOT® system of 16th September 2005.

9 - Identification by IRTF spectroscopy of organic materials that intervene in the manufacture of elements of the pre-assembled kit of the SOLARSPOT® system. Test report nr. BV05-575 dated 27th July 2005.

10 - Durability test 4000 h (BST = 65°C with cycle for plastic materials) en WOM C 15000 (ATLAS) of the PMMA dome associated with a SOLARSPOT® system. Test report nr. CPM 05-0009 (September - October 2005).

11 - Operative test on a preliminary model (scale 1:1) of a pre-assembled kit 250 mm SOLARSPOT® system for a covering of plain terracotta roof tiles and PROTEO® universal outlet from the roof with a rigid base and flexible and expandable flashing (July-August 2005).

12 - Operative test on a preliminary model (scale 1:1) of a pre-assembled kit 375 mm SOLARSPOT® system for a covering of double interlocking roof tiles with a weak relief to the estrados and PROTEO® universal outlet from the roof with a rigid base and flexible and expandable flashing.

13 - Operative test on a preliminary model (scale 1:1) of a pre-assembled kit 530 mm lampost type SOLARSPOT® system for a covering of double interlocking roof tiles with a strong relief to the estrados and PROTEO® universal outlet from the roof with a rigid base and flexible and expandable flashing.

14 - Durability test of 3000h en WOM C165 (Atlas, BST=60°C) on Vegalux sheet protected by PMMA transparent sheet. Test report to be issued.

Dealer:

Copyright by Solar Project srl. 1 gennaio 2002. European patents applied also in USA
Design: Studio Grafico Danilo Silva - Milano