



NATURAL LIGHTING

Delivering Healthy Natural Light Inside



CONTENT

• Introduction to Monodraught	4
• Sunpipe - What is it?.....	7
• Sunpipe - Why Choose it?	8
• Key Features.....	9
• Selection Criteria	11
• Technical Performance	16
• Performance BRE Test	18
• Case Studies	20



Back cover image:
Sunpipe / Battersea Power Station
Photo credit: Battersea Power Station Development Company



We are
With you all the way

www.monodraught.com
info@monodraught.com

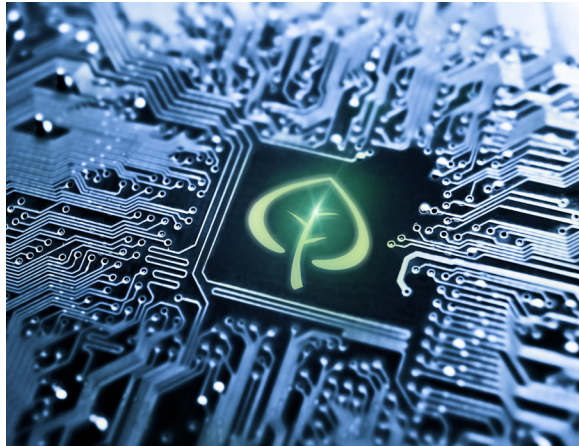
 **Monodraught**

As a pioneering British Greentech company, we design, install and maintain ventilation, cooling, heating and lighting solutions to commercial buildings in the most sustainable way possible.

We believe that businesses like ours have a responsibility to invest in our community. We purchase our materials from local suppliers, recycle where possible and are proud to partner with a local mental health charity, Buckinghamshire Mind.

Monodraught are committed to minimising the carbon footprint of every building to which we supply our products and services. Our in-house design team model the building, select the most energy efficient equipment and design controls to maximise comfort whilst reducing running costs. We continue to monitor performance post-installation ensuring that it continues to be effective year after year. We can provide on-going service and maintenance of our installed products which ensures systems are all always running at optimum performance whilst keeping costs to a minimum.

Trading for over 45 years, we are proud of our record of awards for innovation from prestigious organisations. These include Ashden, CIBSE and the Queen's Award for Enterprise.



Awards & Accreditations:

- Queen's Awards for Enterprise: Innovation 2018 - COOL-PHASE
- CIBSE Building Performance Awards 2017 Shortlist - COOL- PHASE Hybrid
- Best Product/Service Range Category at the 2016 Best Business Awards
- Company of the Year Award 2016 - Buckinghamshire Business First
- Best Business in Wycombe District 2016 Award - Buckinghamshire Business First
- Ashden - Award for Energy Innovation for COOL- PHASE
- ISO 9001 and ISO 14001: Established quality and environmental management certificates
- BSI (British Standards Institute) Members
- CIBSE Building Performance Award 2012 - COOL- PHASE





WHAT IS SUNPIPE?

NATURAL LIGHTING SYSTEM

Sunpipe is a natural lighting system that maximises the concept of renewable energy by channelling natural daylight from roofs to indoor environments.

Sunpipes create healthier, cost-effective and more productive environments.

Sunpipes are suited to almost any application and have been installed anywhere from residential buildings to the Olympic Handball Arena in London. Sunpipe are also designed for optimum efficiency and long working life, offering a **10 year guarantee**.

HOW DOES SUNPIPE WORK?

The Sunpipe system collects daylight using a patented high impact Diamond Dome, passing through a Super-Silver® mirror finished aluminium tube which reflects and directs the natural daylight to the diffuser.

The diffuser distributes the natural daylight evenly in the room.



Battersea Power Station (left) - Olympic Handball Arena (top) - Village Centre Old Cinema (bottom)

Increased Productivity



Productivity in offices served by natural lighting shows a 20% increase in output from office employees along with reduced absences because of sickness.

It is considered that natural lighting systems have marked effect on the reduction of the incidence of Sick Building Syndrome (SBS) and provide a stress-free, soothing, and far healthier office ambiance by eliminating the glare and conflict of the electric lighting and computer screens.

Improved Health



Studies have shown that people work and live better in a naturally lit environment and it has been shown to alleviate some of the symptoms of Seasonal Affective Disorder (SAD). Exposure to natural lighting is believed to have the following benefits by boosting the production of vitamins and hormones:

- Maintains the Circadian Rhythm
- Reduces fatigue and depression
- Alleviates pain
- Improves sleep pattern and mood

Cost Effective



Energy costs can be saved as the need for electric lighting can be reduced by as much as 75%.

Sunpipe is sustainable energy in action, not only can reduce energy, it also leads to a considerable reduction in CO₂ emissions.

Features

- **Glazing details:** Clear impact modified diamond dome (Hi-impact acrylic for Ø230/300/450mm, and Polycarbonate for Ø530/750/1000mm).
- **Lining:** SUPER-SILVER finish aluminium tube in 610 mm lengths
- **Ceiling diffuser:** Prismatic with white ceiling trim and 3 mm plywood (we do not supply plywood with the 750 or 1000 systems)

Advantages

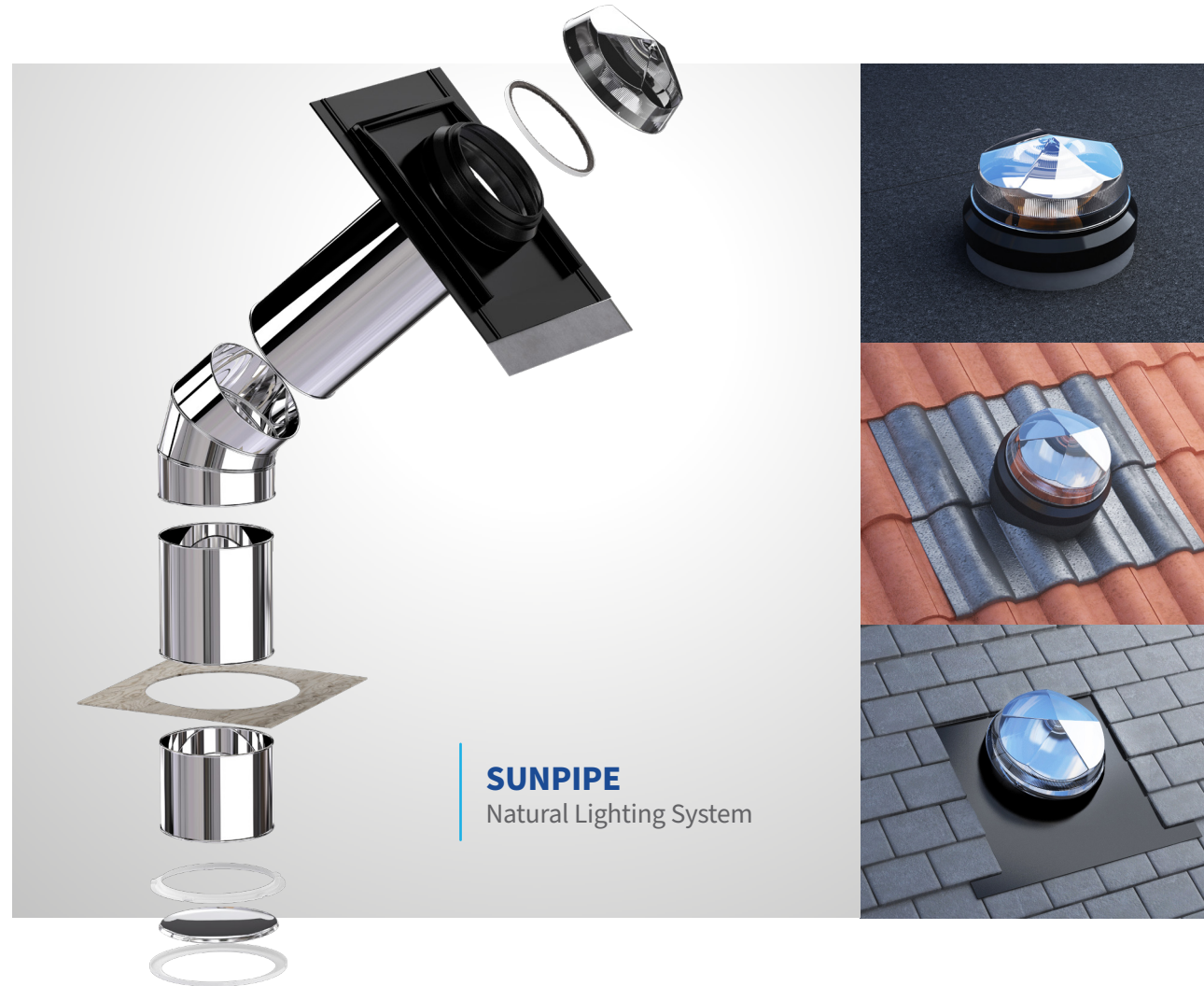
- Generally no structural alterations required, easily fits between joists and rafters
- No maintenance required
- Top domes are self-cleaning due to their shape

Standards

- BS EN ISO 14001 and BS EN ISO 9001
- The Fire-guard ceiling diffuser has been tested to comply with BS 476-20: 1987

Options

- Other bespoke arrangements are available. For sizing guidance or further details, please contact Monodraught Head Office





We are the pioneers of Sunpipes.

They are designed to channel natural daylight from outside to wherever in the indoor environment is required.

Sunpipes are a great solution that enable the user to create a brighter and sustainable indoor environment for happier, healthier and more productive occupants.

Sunpipes are suited to almost any application and have been installed in environments ranging from residential buildings to the Olympic Handball Arena in London, Battersea Power Station and even a 0.5 km long Falcon breeding Centre in Dubai.

Advantages



Education

- Increased achievement rates
- Reduced fatigue factors
- Improved health and attendance
- Enhanced general development

Health Care

- Alleviates symptoms of Seasonal Affective Disorder (SAD)
- No maintenance = No disruption
- Typical payback period of 5 - 6 years

Retail

- Addition of skylights proven to produce a 40% increase in sales

Offices

- 20% increase in employee output
- Reduced absence because of sickness
- Reduced instances of Sick Building Syndrome (SBS)

Improved Health

- Boosted levels of Dopamine, Endorphins, Cortisone, Testosterone in men, and Vitamin D



www.monodraught.com
info@monodraught.com

1 Choose Diamond Dome or Square Sunpipe



Diamond Dome



Square Sunpipe

2 Choose your system size

Sunpipe Dimensions							
	230	300	450	530	750	1000	1500
Sunpipe Diameter (mm)	230	305	457	535	750	1000	1500
Roof and ceiling opening Ø (mm)	250	320	470	550	770	1020	1520

3 Choose Roof Type



Pitched

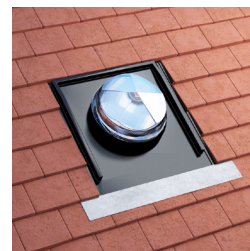


Pitched Gallery



Flat

4 Choose Roof Finish



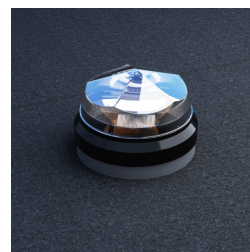
Plain Tile Roof



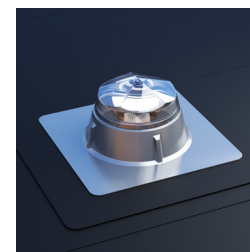
Slate Roof



Bold Roll Roof



Flat Felt/Asphalt
Membrane Roof



Flat EPDM Rubber Roof

Contact us for more
information on metal roofs.

5 Choose from our range of ceiling diffusers

6 Choose Additional/Optional Components (Please refer to page 15)

● **Diamond Dome Sunpipe**

We use high impact acrylic in our patented Diamond Domes which maximises the penetration of natural daylight for Ø230/300/450mm Sunpipes. We use polycarbonate for Ø530/750/1000/1500mm Sunpipes to maximise impact resistance.



● **Squared Rooflight Frame**

690 mm x 780 mm rooflight with a double glazed cover measuring 475 mm x 570 mm which finishes virtually flush with the roof surface. Supplied with code 4 lead skirt to enable suitable weathering. A square to circular transition piece completes the arrangement.



● **ABS Flashing Plate with Weathering Skirt and Foam (For plain tile roof)**

Manufactured from 3.5mm thick ABS capped with PMA for long lasting, durable finish. It is suitable for the majority of plain tile roofs. Supplied with lead alternative flashing for suitable weathering.



● **Sealing Gasket**

Brushed nylon condensation sealing gasket.



ABOVE ROOF COMPONENTS

● **Ubiflex Flashing and ABS Collar (For profile tile roof)**

It will mould to suit any profiled/bold-roll tile, providing a completely watertight finish. Supplied with an ABS collar for diamond dome to fit on.



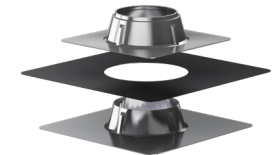
● **ABS Flashing Plate (for slate roof)**

The ABS flashing plate is manufactured from 3.5mm thick ABS, capped with PMA for a long lasting, durable finish. It is suitable for the majority of slate roofs.



● **Composite EPDM Flashing Plate**

The Composite EPDM Flashing Plate is fully watertight and is designed to meet strict installation procedures for weathering into a flat rubber-cover roof.



● **Galvanised Flashing Plate and ABS Collar**

Manufactured from 0.8mm galvanised mild steel which is corrosion resistant and suitable for felt, membrane and asphalt roof finishes. Supplied with an ABS collar for dome to fit mounting.



The Pipe: **SUPER-SILVER** finish aluminium tube

● **610mm Extension Pipe**

The 610mm extension pipe has a crimped end in order to connect to a plane end pipe. It is manufactured from a silverised PVD coated mirror finished aluminium with a total reflection of 98%.



● **610mm Plain End Pipe**

This 610mm plain end pipe is the first section of the Sunpipe that integrates with the roof fixing arrangement.



● **Slip Length**

The 250mm ceiling extension is the last section of the Sunpipe that integrates with the collar in the diffuser arrangement.



BELOW ROOF COMPONENTS

Elbow

● **45° Adjustable Elbow**

The 45° adjustable elbow is fully adjustable to allow navigation around roof void obstacles.



Ceiling Diffusers

- Choose from our range of ceiling diffusers the style that best suits your project.



The following range of diffusers is available for the **Sunpipe 230mm, 300mm, 450mm and 530m**. We offer a high quality product both in terms of aesthetics and installation.

4 Stylish options to choose from:
You can choose a **white satin** or **stainless steel bezel**. (**Opaque Glass panel** is only available with stainless steel bezel and for 230 and 300mm Sunpipe)

Orion
(Curved Microprism)



Contemporary
(Flat Microprism)



Opaque Glass
(Flat)



CEILING DIFFUSER OPTIONS

Step 1: Type of bezel (Colour/Material)

White Satin

(Not available with opaque glass)



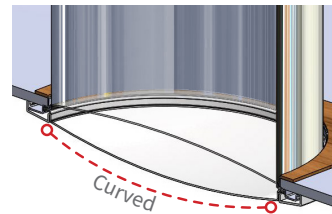
Stainless Steel



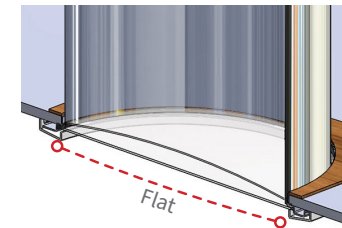
Step 2 & 3: Type of Diffuser Panel (Shape/Material)

Shape:

Curved (*Orion only)



Flat



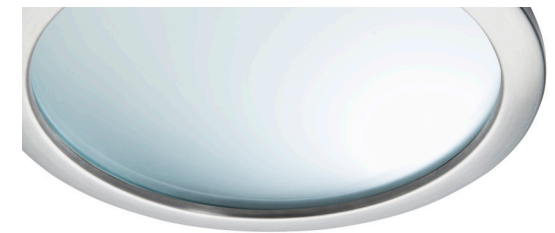
* All diffusers are able to be retrofitted to existing Sunpipe installations and a new backing template will be provided in all new orders.

Material:

Microprism Polycarbonate

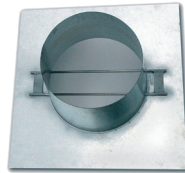


Opaque Glass



- **Security Bars**

Provides extra security by means of integrating stainless steel security bars which do not impact the light output of the system.



- **Motorised Shut Off**

Features a butterfly light shut-off damper controlled by a 230V motorised actuator for use in areas such as lecture theatres, conference halls, etc.



- Other bespoke arrangements are available. For sizing guidance or further details, please contact Monodraught Head Office.

ADDITIONAL COMPONENTS





External Illuminance (LUX)

Sunpipe Size (mm)	Full Summer Sun 75 k	Overcast Summer 50 k	Overcast Winter 25 k
	Lumen Output		
300	5157	3438	1717
450	8560	5707	2851
530	12782	8521	4256

U-Value

Sunpipe's U-Value compares favourably alongside a double glazed roof-light.

As the actual area of a Sunpipe is only a small percentage of that of a typical roof-light, the contribution to heat loss from the building or heat gain is greatly reduced.

The performance of Sunpipe has also been assessed as part of a European study of light-pipe performance, TC3-38. The introduction of the double glazed ceiling diffusers has further enhanced the U-Value of Sunpipe, lowering the figure to 1.66W/m²K for a typical application of 1.5m length of Sunpipe - This is further improved to a value of 1.38W/m²K when incorporating EcoShield.



TECHNICAL PERFORMANCE

Lengths & Bends

Smaller sizes have recommended total maximum pipe length of 8m. Larger sizes allow for longer lengths to be used.

There is a 12% reduction of light output for each 45° bend used and there is a 6% reduction in light transmission for every metre of Sunpipe.

45° adjustable elbow can be used with all Sunpipe applications to direct daylight to where it is required.

Standards

- BS EN ISO 14001 and BS EN ISO 9001

Advantages

- Generally no structural alterations required, easily fits between joists and rafters.
- Virtually no maintenance required.
- Top domes are self-cleaning due to their shape.



At Monodraught we pride ourselves on the quality of our engineering. Because of this, we design our systems very carefully in accordance with the message we want to convey:

- Performance
- Innovation
- Sustainability
- Reliability

We firmly believe that Sunpipe is demonstrably the best balance of outright performance, durability and longevity on the market today.

To quantify this, we subjected one of our Sunpipe Natural Daylight systems to both light Transmittance Test and an Accelerated Ageing Test against one of our leading competitors to compare their performance.

The aim of the test was to observe how the materials in each system perform over the life cycle of the product in a simulated outdoor environment.

The Test

Samples of materials used in the dome and tube parts of both Monodraught and a leading competitor's product were sent to BRE's research facility in Watford.

These samples would be tested to determine their **specular reflectance** and **light transmittance** for the tube and dome samples respectively.

They would then be placed in an accelerated ageing chamber to simulate the effects of the natural environment on the samples and removed periodically to be retested to determine the effects.

Specular Reflectance & Total Reflectance

Specular reflectance refers to the mirror-like reflection of light from a surface, in which light from a single incoming direction is reflected into a single outgoing reflection.

Light reflecting materials are most often marketed using values of Total Reflection, which takes into account both specular and diffuse reflection light.



● Tube sample specular reflectance

The specular reflectance tests confirm our hypothesis of polymer laminate films susceptibility to direct UV damage.

Over a simulated 4 year period, the unprotected polymer laminate tube samples lost between **77.8%** and **84.9%** in specular reflection.

Conversely, the unprotected Monodraught samples experienced a maximum drop in performance of only **2.8%**.

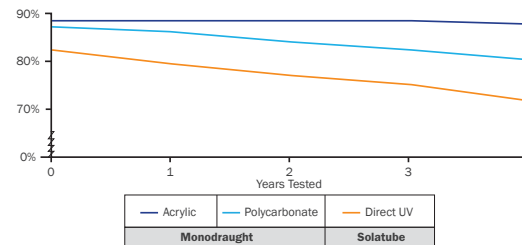
Dome Sample	Reflectance before ageing	Reflectance after 1000 hours artificial ageing	Reflectance after 2000 hours artificial ageing	Reflectance after 3000 hours artificial ageing	Reflectance after 4000 hours artificial ageing
Monodraught sample 1	93.6%	92.5%	91.4%	91.5%	90.8%
Monodraught sample 2	93.3%	93.5%	92.8%	93.0%	93.3%
Monodraught sample 3	92.9%	92.2%	91.5%	91.0%	91.1%
Solatube sample 1	98.7%	94.6%	87.6%	66.0%	16.0%
Solatube sample 2	98.8%	94.7%	86.3%	57.0%	13.9%
Solatube sample 3	98.8%	94.6%	86.9%	67.6%	21.0%

* 1000 hours is broadly equivalent to one year of UV exposure in the natural environment.

● Clear dome light transmittance

Monodraught's acrylic dome had the highest initial transmittance of **87.6%** and suffered a 1% drop in performance - within the boundaries of experimental error.

Leading competitor's Polycarbonate dome sample had the lowest initial transmittance of **83.5%** and the highest drop in performance of 8.4%.



Dome Sample	Transmittance before ageing	Transmittance after 1000 hours artificial ageing	Transmittance after 2000 hours artificial ageing	Transmittance after 3000 hours artificial ageing	Transmittance after 4000 hours artificial ageing
Monodraught Acrylic	87.6%	87.2%	87.4%	87.1%	86.6%
Monodraught Polycarbonate	86.6%	85.5%	83.5%	81.8%	79.6%
Solatube Polycarbonate	83.5%	80.6%	78.2%	77.1%	75.1%

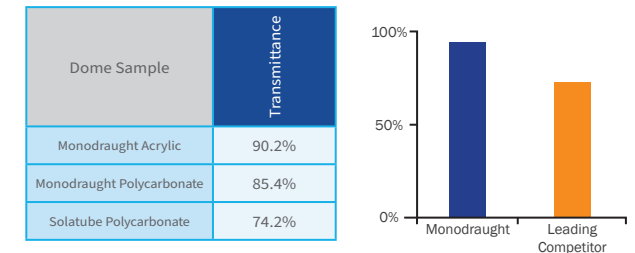
* For Clear Dome Sample Tests, clear sections were cut from each dome to determine the materials transmittance. This meant that dome redirecting technology did not interfere with results.

● Full dome light transmittance

The three domes from which the samples were taken were also tested, unmodified in any way, for their light transmittance. This is to clarify what effect the light redirecting technology in each dome affected the total light transmittance.

Monodraught's acrylic diamond dome had the highest transmittance of **90.2%**.

Leading competitor's Polycarbonate dome had the lowest transmittance of **74.2%**.



* For Full Dome Transmittance tests, each dome was placed, unmodified, over an opening sized to suit the diameter of the pipe it would accommodate. This means all dome redirecting technology is accounted for in the test.

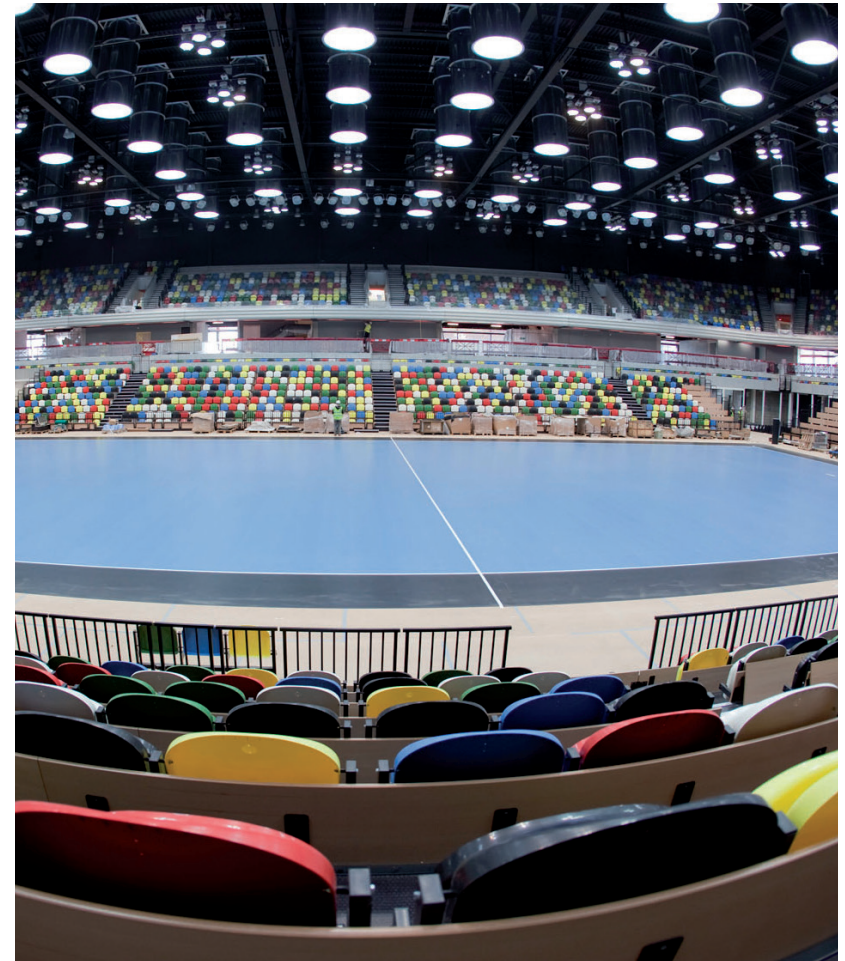
Copper Box - Handball Arena

- **Location:** London
- **Application:** Leisure/Sports Centre
- **Sector:** New Build
- **Architects:** Make Architects
- **Consultants:** ARUP
- **Products Installed:**
 - 88 No. SUNPIPE Monodraught Natural Lighting systems

Originally named the Handball Arena, the Copper Box was built to be the goal ball venue for London 2012 Olympics & Paralympics. As one of the legacy buildings of the Olympics, the Copper Box will be adapted to become a multi-sport arena for local community use, athlete training and other multi-use events.

Make Architects, responsible for the design set out a strict environmental criteria for the project of sustainable energy. Along with rainwater harvesting, the use of natural daylight would assist in reducing carbon and energy costs. Having used the SUNPIPE® natural daylight systems on previous projects Make Architects entered in to discussions with Monodraught Ltd in May 2008 to investigate the possibilities of using this technology on the project. Make Architects specified a system that could deliver a 4% daylight factor.

Working with ARUP the Consulting Engineer, Monodraught presented a scheme that included 88 number 1500 mm diameter light pipes positioned strategically around the





field of play. The systems also needed to be adaptable for when lower light levels were required so light shut off dampers were included along with special acoustic laminated glass.

Due to the nature of the project and the amount of congestion expected near the Olympic site, the systems were manufactured off site and delivered in sections ready to be installed on site.

- Estimated annual savings of 40% against electrical lighting costs
- Double glazed, high impact resistant glass
- Low U & G values
- Automatic damper controls to regulate sunlight
- Low maintenance, long life systems
- 4% daylight factor achieved
- Offsite pre-fabrication

ZF Electronics

- **Location:** Klasterec Nad Ohri, Czech Republic
- **Application:** Manufacturing/Offices
- **Sector:** New Build
- **Architect:** CH PROJEKT PLZEŇ s.r.o.
- **Contractor:** Kajima Czech Design and Construction s.r.o
- **End-customer:** ZF Electronics

- **Products Installed:**
 - 112 No. 1000mm diameter SUNPIPE Natural Lighting systems

Using natural daylight in sustainable buildings has been proven to create healthier indoor environments. It leads to more productive and happier occupants and reduces carbon emissions. Sunpipe is a natural lighting system that channels natural daylight from outdoors to indoor environments.

We design and manufacture our Sunpipe systems in the UK. Independent tests demonstrate the highest sustained reflectance and transmittance compared to competitor solutions. Sunpipe tubes are manufactured from PVD coated aluminium meaning they won't deteriorate over time.

Monodraught work with a selection of export partners across the globe to deliver our zero carbon natural lighting solutions. Monodraught recently supplied over 100 Sunpipe





systems to Kajima in the Czech Republic. The systems have been installed on a customer site of theirs, a manufacturing plant. The Sunpipes were installed above the production area for sensors and switches.

Initial anecdotal feedback from Kajima is positive, commenting on the simplicity of installation. We have been told that there is lots of light in the hall during sunny days. As a result of the Sunpipe installations, it is not necessary to use artificial lighting throughout the day. This brings benefits to employees in terms of natural light being brought indoors. Using natural lighting systems reduces a building's impact on the environment by cutting down on energy use and carbon footprint.

WE ARE WITH YOU ALL THE WAY



R&D and Manufacture



Our large R&D team are continually challenging the boundaries developing new products to ensure customers continue to receive market leading products for which Monodraught are renowned. These products are all manufactured within our High Wycombe factory and as R&D is in the same location as production, then the highest levels of quality can be ensured.

Building Simulation



To help architects and consultants deliver ultra low energy efficient designs, Monodraught and building performance analysis specialist IES have developed Performance Components. Our Project Design Engineers are able to work with you to create the right design for your building.

Installation



We have a team of contract managers who will work with you and your clients from order creation through to delivery and maintenance if required. Our own team of installers work across England and Wales with partner agencies installing in Scotland, Ireland and worldwide. We will visit your site ahead of installation to ensure that everything goes smoothly.

Maintenance



We can provide on-going service and maintenance of our installed products. This helps provide performance data for our customers and structured feedback that can assist product development, resulting in a system running at optimum performance whilst keeping costs to a minimum.





Halifax House, High Wycombe
Buckinghamshire, HP12 3SE



+44 (0) 1494 897700



www.monodraught.com



info@monodraught.com

Follow us on:

