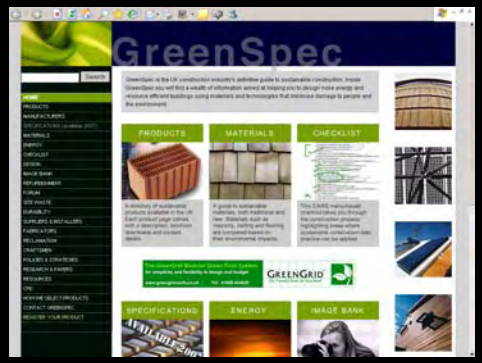


COMMENDED
The UK eWell-Being Awards 2004
www.sustainit.org

National Green Specification

www.greenspec.co.uk

Air movement in & about buildings 6 of 9 + Q&As

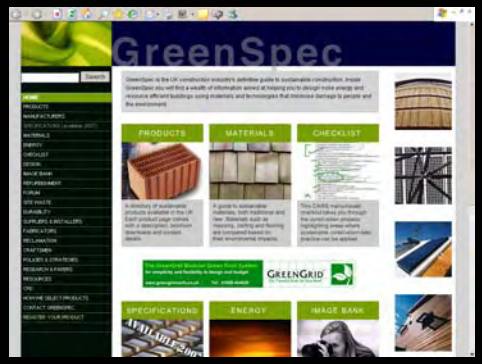
 CPD in 10 parts

GreenSpec CPD Seminar Series

- Educational Objective:
  - Comprehensive introduction to subject: from wind to air-conditioning and a lot more in between
  - emphasis on environmentally sustainable solutions
  - design primer: addressing principles and solutions
  - technically rich: materials, construction, services & testing
  - Related GreenSpec CPD Seminars indicated
  - Questions and answers for each subtopic in file 10
- Audience:
  - Architecture Students Part 1 Year 2
  - CPD update for all levels of experience & knowledge
- Delivery:
  - 3 to 4 hours depending upon audience participation
  - Reading 1 hour
  - 26 subject breaks to enable subdivision

Air Movement in Buildings: 6 of 9 Sub-topics in 10 separate files

- Principles of Element Design
- Climate Change
- Wind
- Wind Tunnel Testing
- Wind Turbines
- Natural Ventilation
- Moisture Vapour & Condensation
- Thermal Insulation
- Breathing Construction
- Airtightness
- Wind & Airtightness Testing
- Building Elements
- Passive Ventilation
- Active Ventilation
- Stack Effect
- Atrium
- Solar Orientation & Solar Gain
- Conservatories
- Thermal mass
- Conduction, Convection, Radiation
- Solar Shading
- Thermal mass, Passive and active cooling
- Fluid dynamics
- Mechanical Ventilation
- Air-Conditioning
- Questions and Answers



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Passive Ventilation

Passive & Stack Effect

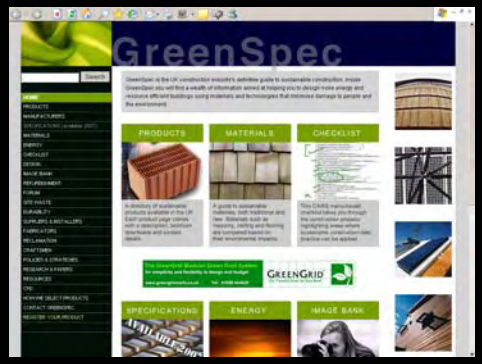
Passive Ventilation

- Passive ventilation can be in numerous forms
- Cross ventilations using open windows and doors on both sides of a building and prevailing winds driving fresh air through
- Venetians use windows close to and either side of the corners of buildings to catch air currents in a tight urban environment
- Stack effect to draw air from warm interiors and draw cooler air in to replace it
- Lift and stair shafts have ventilation at their heads to release smoke this can add to the ventilation but probably is uncontrolled


Yurt: Roof vent

Passive stack ventilation

Passive Stack Ventilation



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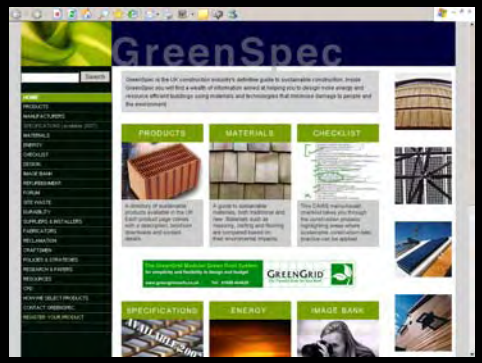
Active Ventilation

Air pressure driving passive ventilation



Active ventilation

National Green Specification

www.greenspec.co.uk

- Using Passive ventilation principles
- Adding controls and actuators to open and close valves, flaps and vents
- Harnessing the power of nature (wind pressure) to drive the passive systems


GreenSpec
Environmental Building - Windows Internet Explorer
http://www.greenspec.co.uk/html/imagebank/jspw3_pop.htm?..._v_w_d_..._v_w_d_images_v_w_d_imagebank_v_w_d_BREEnviro_v_w_d_BRE1.jpg,812,1,,0,E
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REGISTER YO
IMAGE BANK
Shorne Wood
BedZED
Attenborough Centre
Done
Environmental Building
Internet
100%

Image Bank - Content

	Shorne Wood	Lee Evans Partnerships bravura display of structural timberwork using locally sourced sweet chestnut forms the essence of this visitor's centre at Shorne Wood Country Park set in the Kent Downs.
	BedZED	Bill Dunster's triumphant realisation of a sustainable urban live/work community.The development comprises of 82 homes, 18 work/live units for the Peabody Trust in the London Borough of Sutton.
	Attenborough Centre	Groundworks Architects RIBA Award winning exemplar building for the Attenborough Nature Centre. This visitors centre is located in a flooded gravel pit and features a wood frame and cladding along with solar panels and a water heat pump.
	Kingsmead School	White Design's all-wood primary school in Northwich caters for 150 children. It features natural ventilation and lighting, super-insulation, rainwater harvesting and use of photovoltaic and solar panels along with a bio-mass boiler heating system.
	Environmental Building	The BRE's offices at Garston is used to demonstrate all of the characteristics and attributes of what new "Green" building technologies have to offer.

BedZED

BedZED (Bill Dunste ng by tackling
sustainability in ever demand, eliminating
the need for space h signed facilities and
services that make it car use. BedZED
achieves the high de st still providing a
healthy internal envir nlight. See also the
BedZed: Constructio





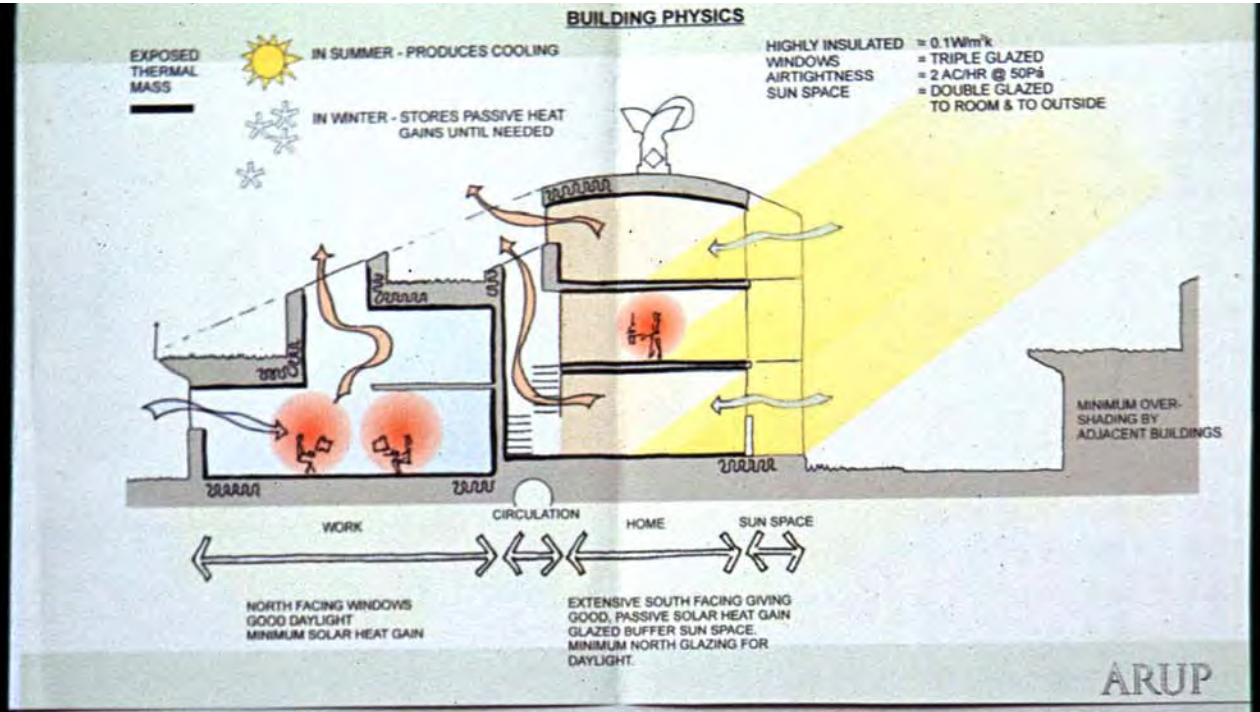


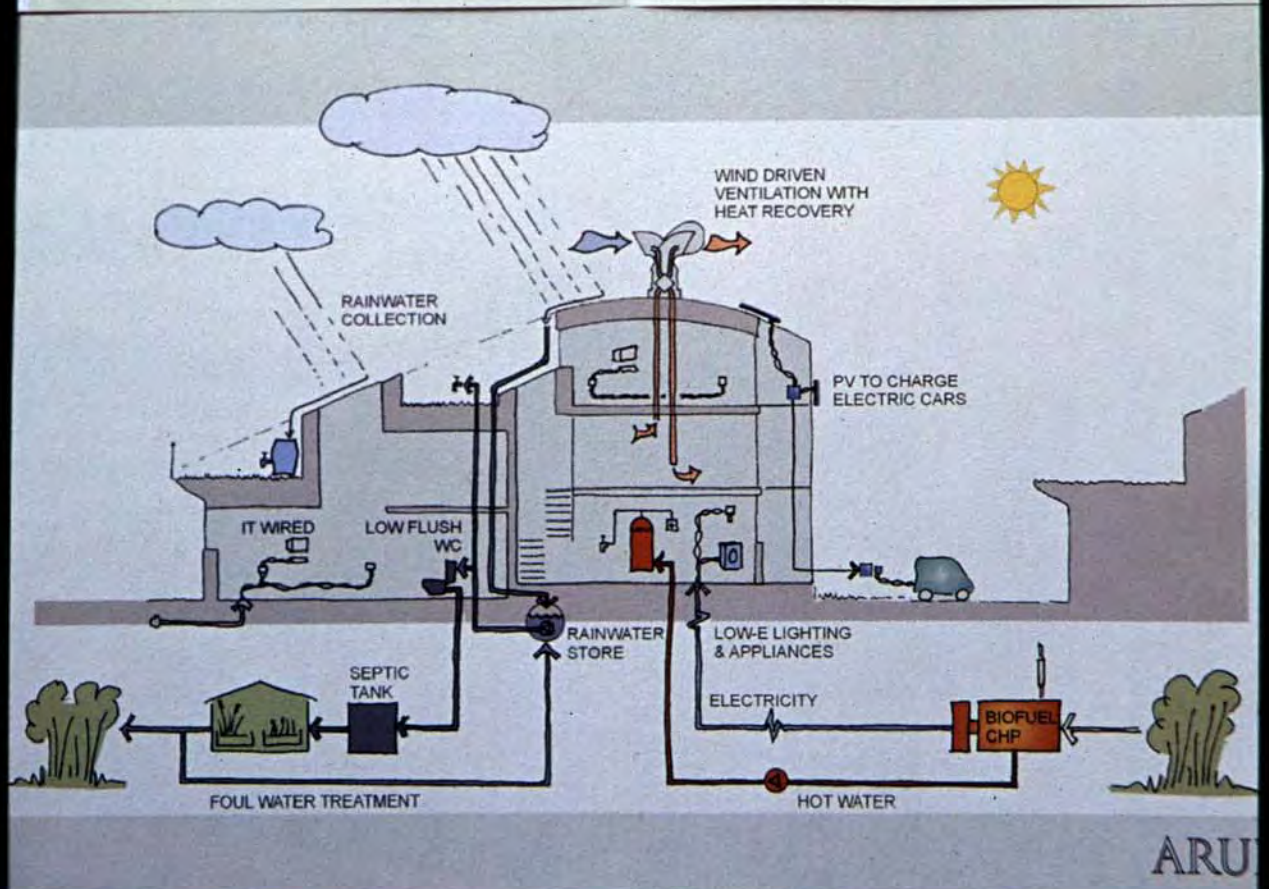










Wind pressure pushes fresh air in driving stale air out, with heat exchange to prevent heat loss

BedZED

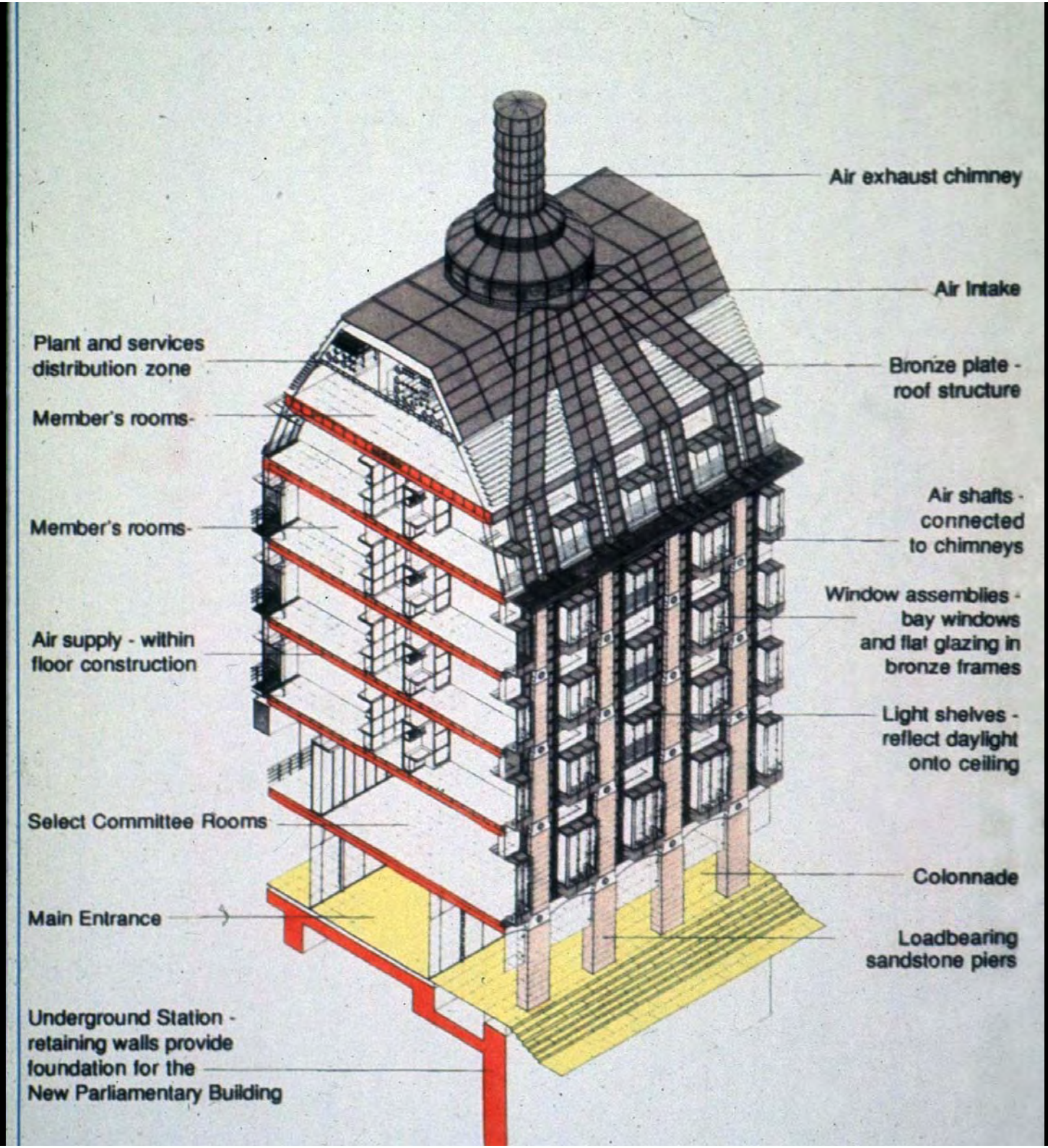
Active ventilation:

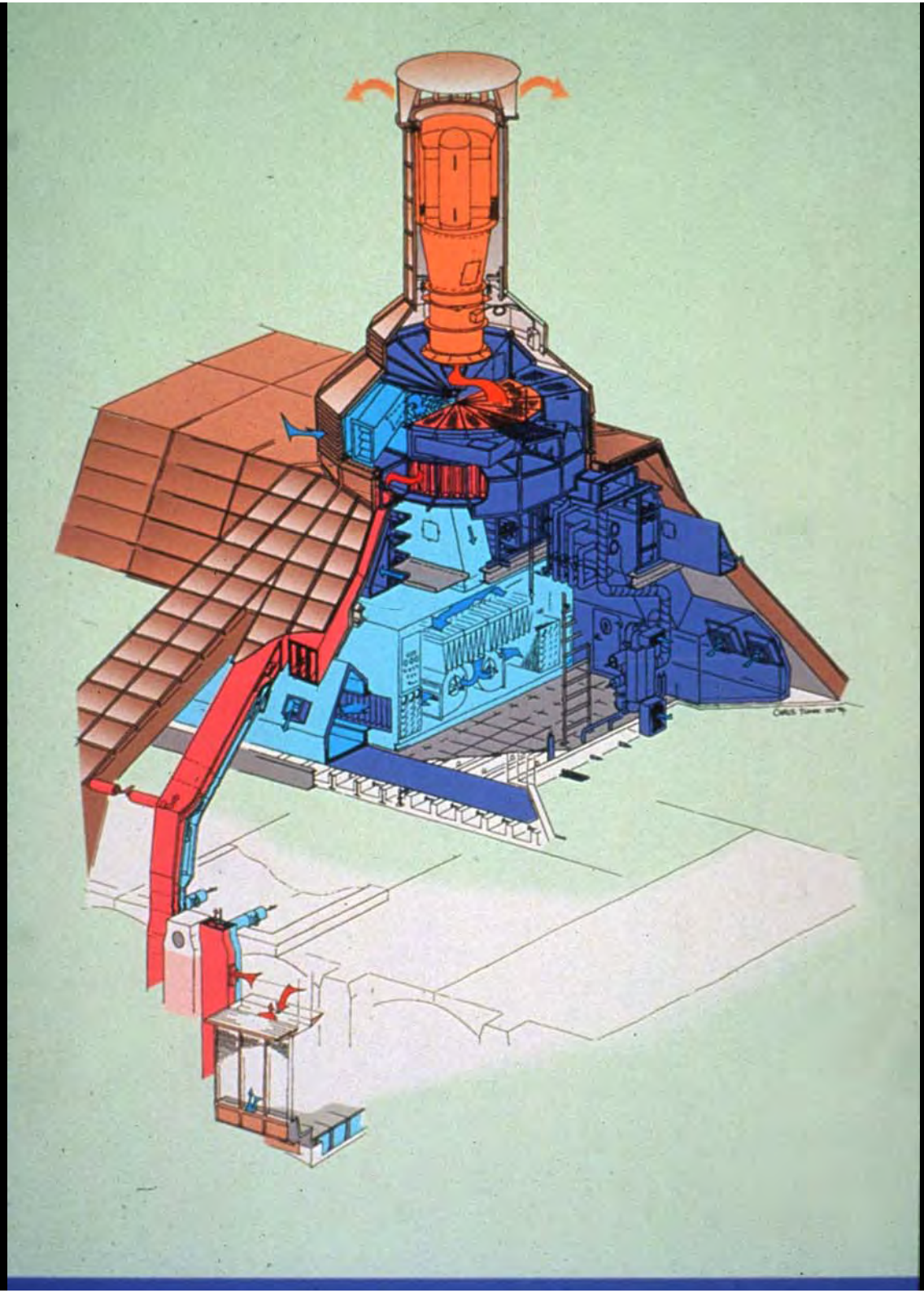
wind captured pushed into building, driving air out,

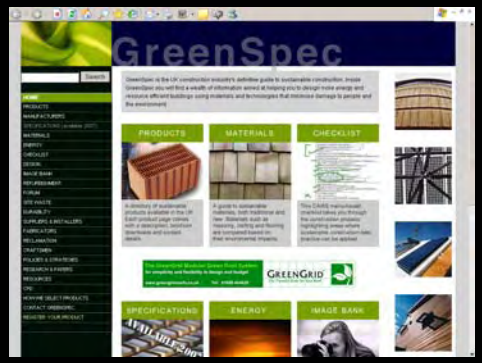
heat transferred where they pass

BedZED


Jubilee
Campus
Nottingham
Uni


Air exhaust chimney
Air intake
Plant and services distribution zone
Bronze plate - roof structure
Member's rooms
Air shafts - connected to chimneys
Member's rooms
Window assemblies - bay windows and flat glazing in bronze frames
Air supply - within floor construction
Light shelves - reflect daylight onto ceiling
Select Committee Rooms
Colonnade
Main Entrance
Loadbearing sandstone piers
Underground Station - retaining walls provide foundation for the New Parliamentary Building





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Stack Effect

Stack effect

- Chimney stacks are a route from the building interior to exterior at high level
- With a source of heat at the base the warmed less dense air will be buoyant and rise to high level
- Cooler air will be drawn in to replace the warmed air leaving by the chimney
- Once the flow is started this effect is self propelling
- A venturi throating makes this irresistible
- This is called the stack effect and it can be exploited in designs to ventilate buildings

Stack effect Brick Kilns: Often lime making in widespread cottage industry

Chimneys use stack effect

Cooling Towers: stack effect but not to be confused with building ventilation


Chimneys are part of UK history and
a part of our psyche

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Environmental Building - Windows Internet Explorer

http://www.greenspec.co.uk/html/imagebank/jspw3_pop.htm?..._v_w_d_..._v_w_d_images_v_w_d_imagebank_v_w_d_BREEnviro_v_w_d_BRE1.jpg,812,1,,0,E

Done

Internet

100%

Environmental Building

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IMAGE BANK
Shorne Wood
BedZED

Stack Vents to car parking

Staircase void can play its part in the stack effect

Need air in at bottom and air out at top

Roof lights, windows & vents

- High level rooflights are an essential part of passive ventilation using the stack effect without the chimney
- They need to be well insulated to minimise winter heat loss
- They are best controlled to ensure optimum performance: i.e. once a temperature is reached then open to get the stack effect off to a good start


Iron age round house
Castle Henlly S. Wales


Perimeter ventilation, cooking and heating fire and vented apex





Eden Project - Windows Internet Explorer

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Done Internet 100%


Stack effect: Rooms
Opening Rooflights and windows

Interger Millenium House
Eden Visitor Centre











Stack effect: circulation areas
needs low level perimeter air in

National Trust HQ Swindon

Chimneys replaced by Passivent at Greenwich Millennium Village

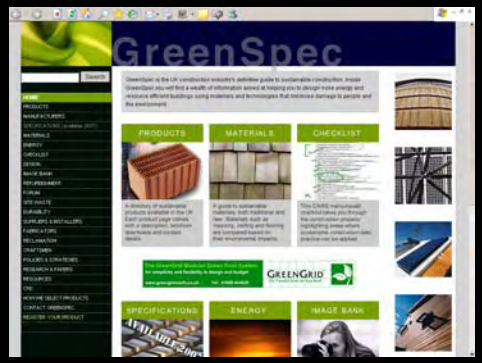
Humidity Actuated Vents

- Passivent closed normally
- Humidity sets off vent to open and release air
- Using stack effect the humid hot air rises up the vent pipe to evaculate at high level externally

Sun Pipes & Passive Vents

- Sunpipes bring daylight and sunlight to the interior of building with no windows
- Add concentric ventilation duct
- Include valves
- But heat recovery from ventilation not normally available
- Modern substitute for the light well and chimney

Stack ventilator/sun pipe



National Green Specification

www.greenspec.co.uk

GreenSpec Products

Ventilation and light

GreenSpec

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GreenSpec is the UK construction industry's definitive guide to sustainable construction. Inside GreenSpec you will find a wealth of information aimed at helping you to design more energy and resource efficient buildings using materials and technologies that minimise damage to people and the environment.

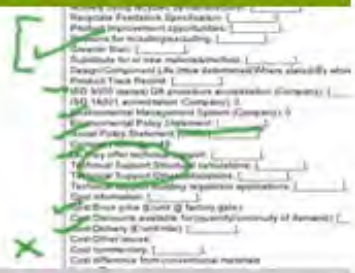
PRODUCTS

A directory of sustainable products available in the UK. Each product page comes with a description, brochure downloads and contact details.

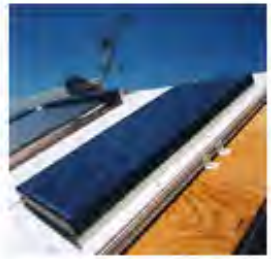
MATERIALS

A guide to sustainable materials, both traditional and new. Materials such as masonry, roofing and flooring are compared based on their enviromental impacts.

CHECKLIST



This CAWS menu-based checklist takes you through the construction process highlighting areas where sustainable construction best practice can be applied.



SPECIFICATIONS

ENERGY

IMAGE BANK

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Search

L753 Impelling Equipment

natural ventilation / extraction

Manufacturer	Product	Type	
Monodraught	Windcatcher	passive stack ventilation system	✓

Key

product / equipment with climate change reduction potential

Monodraught 'Windcatcher'

Passive stack ventilation system

Windcatcher technology provides natural ventilation without any moving parts. Using compartmentalised vertical vents, fresh air is brought into the room and stale warm air expelled using the natural effects of the wind.

The system works through normal atmospheric properties where warm air rises and decreases the air pressure within a room so that cooler air falls into the room. This is a subtle change in air pressure and it produces only enough airflow to make the room comfortably fresh.

Stale and stagnant air is extracted by the wind blowing onto the wind-ward side of the windcatcher, with the stuffy air going out through the leeward side of the ventilation stack.'

Manufacturer's evidence rating:*	★
Material/s:	unknown
Environmental statement:	none
BRE Ecopoints:	unrated
BRE Environmental profile:	unrated
Other environmental standards:	none
3rd party accreditation:	none
3rd party product endorsement:	none
Reusability / Recyclability:	unknown
% of post consumer waste:	unknown
Life expectancy	unknown
Substitute for or new materials / method:	mechanical ventilation

Life expectancy	unknown
Substitute for or new materials / method:	mechanical ventilation
Editors' comments:	
Country/s of manufacture:	UK
UK distribution location:	Buckinghamshire
Downloads:	Product brochure
Product specification clause:	-
Work sections:	-
Manufacturer:	Monodraught Ltd.
Address:	Halifax House, Cressex Business Park, High Wycombe, Bucks HP12 3SE
Telephone:	01494 897700
Email:	info@monodraught.com
Website:	www.monodraught.com
Available direct:	yes
Suppliers:	Monodraught
Alternative products:	Ventilation
Further information:	
Information last updated:	Monday 24th, July 2006

The product has been selected on the above average performance in the following areas:

-	Abiotic depletion	-	Acidification
✓	Global warming	-	Eutrophication
-	Ozone layer deplection	-	Solid Waste
-	Human toxicity	-	Radioactivity
-	Fresh water aquatic ecotoxicity	-	Minerals extraction
-	Terrestial exotoxicity	-	Water extraction
-	Photochemical oxidation		

*Note:

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PRODUCTS CONTENTS
L2 Complete construction entities
L3 Structural and space division
L4 Access, barrier and circulation

L414 Rooflights

sunpipes

Manufacturer	Product	Type			
Monodraught	SunPipe	sun pipe	✓		
	SunCatcher	combined sun pipe & passive stack ventilation system (domestic size)	✓		

Key

product / equipment with climate change reduction potential
sustainable product
product with recycled content

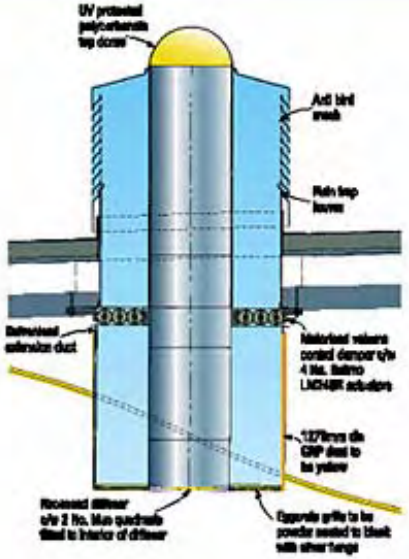
Monodraught 'SunCatcher'

Combined sun pipe & passive stack ventilation system (domestic size)

Monodraught SunCatchers provide a most satisfactory solution of combining natural light and natural ventilation in one composite unit.

The Monodraught SunCatcher system provides controlled natural ventilation as well as providing all the benefits of natural daylight. Any prevailing wind pressure carries a continuous fresh air supply through weather protected louvres on the windward side of the system at roof level. The wind movement is encapsulated by internal quadrants which turns the wind through 90° forcing air down through internal ducts into the room below, slightly pressurising the internal space. Warm, stale air is expelled from the room by the Passive Stack ventilation principle of differential temperatures and the natural buoyancy of air movement. Manual or motorised motors at the base of the system control the rate of ventilation. The central SunPipe is integrated into the system and conveys natural daylight to the same room
or internal space.'

Manufacturer's evidence rating:*	★
Material/s:	includes aluminium, polycarbonate and nylon
Environmental statement:	none
BRE Ecopoints:	unrated
BRE Environmental profile:	unrated
Other environmental standards:	none
3rd party accreditation:	none
3rd party product endorsement:	none
Reusability / Recyclability:	aluminium is recyclable
% of post consumer waste:	unknown
Life expectancy	unknown



3rd party product endorsement:	none
Reusability / Recyclability:	aluminium is recyclable
% of post consumer waste:	unknown
Life expectancy	unknown
Substitute for or new materials / method:	lighting systems & mechanical ventilation
Editors' comments:	
Country/s of manufacture:	UK
UK distribution location:	Buckinghamshire
Downloads:	Product brochure
Product specification clause:	-
Work sections:	-
Manufacturer:	Monodraught Ltd.
Address:	Halifax House, Cressex Business Park, High Wycombe, Bucks HP12 3SE
Telephone:	01494 897700
Email:	info@monodraught.com
Website:	www.monodraught.com
Available direct:	yes
Suppliers:	Monodraught
Alternative products:	Natural lighting
Further information:	
Information last updated:	Monday 24th, July 2006

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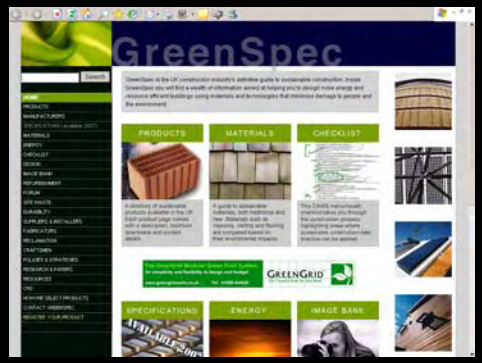

National Green Specification

www.greenspec.co.uk

Atrium & Atria

Atrium

- Atrium could be described as Courtyard with roof
- They provide the usual wind shelter some sun penetration and add other opportunities:
- The help to minimise the heat loss from walls that face the courtyard by preventing the rising heat being lost to the sky
- They allow those walls to be open to the atrium
- The Atrium may also include walkways and balconies adjacent to the atrium
- Implications for fire strategy of building
- They may have smoke vents at high level and replacement air vents at low level
- These may act as cooling vents in hot weather

THE ARCHITECTS' JOURNAL

23 MAY 1990/£1.10

AJ

Imperium Reading

Bennetts Associates

Atrium, Left: offices, Right: Open Plan

Devonshire Building Newcastle

Sometimes Lift Cars add to air movement

or lift shafts lose heat via permanent vents

Atria in 3 parts
helix at the edge of
the building
In 3 zones
7 stories each.
Casements in façade
or in pavement

Test Yourself

- Part 6
- What are the necessary parts of Stack effect?
- Stack effect has been exploited for many centuries name an early example
- How can stack effect be used today

How did you do?

- Part 6
- A vertical space or duct with heat or heat source at bottom, exit for air at top and entry for air at bottom
- Iron age fort roundhouse
- To remove hot air from buildings by permitting cool air in to replace hot stale air which rises through high level vents

Air Movement in Buildings: 6 of 9 Sub-topics in 10 separate files

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