

It has got to be GREEN

Building services designers, architects and the rest of the construction industry is moving towards a "greener" type of building but most agree that much stricter regulation is required to give impetus to this movement. * Mike Yuille spoke to some of the leaders in the field of environmentally friendly design and green labelling

Economy is one of the basic principles of building design founded by the Greek architect Vitruvius in the fifth century BC. Almost 2,500 years later building designers are learning the significance of Vitruvius' law in relation to something the old Greek could never have dreamed of—namely, environmental destruction.

Research shows buildings to be responsible for half the total UK energy consumption, while directly and indirectly producing half the total carbon dioxide and other greenhouse gas emissions. Buildings are both major cause and victim of ensuing climatic changes. In a world being suffocated by pollution and the greenhouse effect, caused largely by the burning of its depleting fossil fuel reserves it is time for building design to clean up its act.

And designers are slowly awakening to the challenge, with a fascinating combination of high tech and rediscovered low tech wisdom. Indeed, Vitruvius and his contemporaries would certainly have appreciated the irony in designers modifying technology by returning to first principles originated by the ancients. This can be seen with some of the precepts of low energy buildings and their interaction with the environment.

New building design must take into account climatic changes expected in the near future. There will be an effective doubling of CO₂ levels as early as the 2030s—well within the life of buildings now on the drawing board. Buildings currently contribute over 300 million tonnes of CO₂ into the atmosphere in the UK, and although there will soon be moves to enforce a drastic cut the damage is already being done. By the 2030s the greenhouse effect may have caused global warming of up to 4.5°C.

Rainfall is expected to increase by 7–15%, particularly in the higher latitudes, and winds by as much as 30% in the transitional period to a warmer climate.

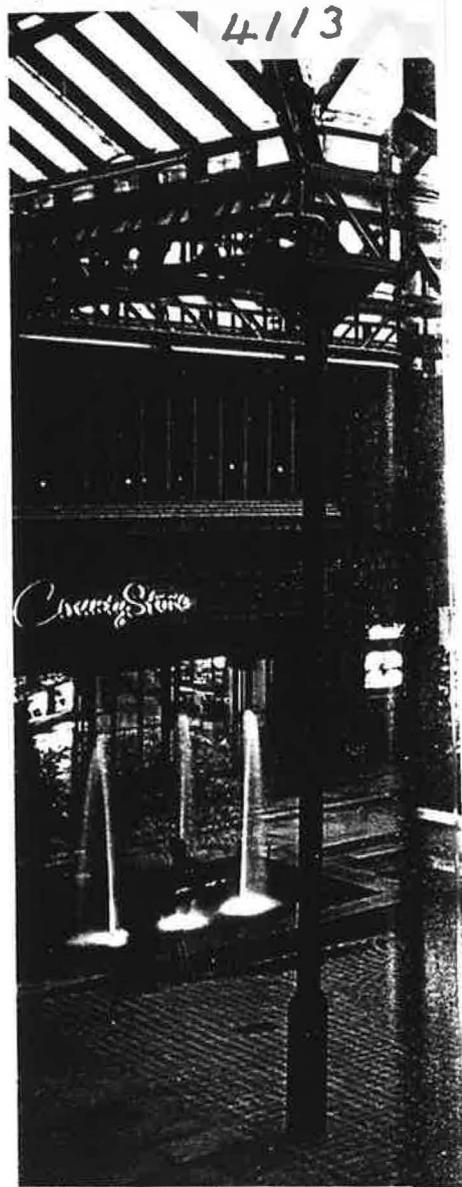
The implications for building designers are wide-ranging, from roofing and guttering, to wind-loading, materials, insulation, and cooling without CFCs. The bottom line, however, is energy and its conservation.

The low-energy building is fast becoming a popular concept, and there are many instances where a relatively shallow, naturally lit and ventilated building will meet all requirements. The Building Research Establishment (BRE) has for a while been running a Low Energy Office as a state of the art, naturally ventilated, highly insulated, electrically heated building which has provided valuable design guidance in this area. The BRE's study of buildings and the greenhouse effect is led by George Henderson. "We're looking at thermal insulation, more efficient heating systems, better controls, and air conditioning. We're also concerned with administering these improvements in the field," he says. The trick with low energy buildings is getting the summer design right, so solar gain can be controlled, the ventilation is sufficient, and lighting is needed only on cloudy days.

Solar

Passive solar designs provide an economic solution for lighting and heating, and the BRE is advising the Department of Energy on a programme of research and development to realise the potential of daylighting.

One of passive solar's leading exponents is Frank Mills of Building Design Partnership (BDP). "The idea is to use glass as an envelope to capture solar energy and feed it into the building," he says. "Passive solar is a re-discovery of what the Victorians were doing with the atrium, originally to get daylight in." Fine



examples of Victorian atria can still be seen today at the Burlington Arcade, Piccadilly, and the Royal Arcade, Cardiff.

"We're going back in time, using computer tools to find out in more detail how these buildings work."

Mills put his ideas into practice in 1987 as the Project Engineer for the £16 million Carlisle Lanes shopping centre which scooped up a RIBA design award, and he was responsible for the £35 million International House development at Ealing Broadway.

There is a lot of high-tech in the seemingly low-tech basics of passive solar design. "We're trying to relearn some of the solutions the Victorians came up with—they had techniques for making a building perform. We need to go back to understanding the physics of a building." Forward thinking is essential for designers, insists Mills. He cites the 'cradle to grave' planning in the US which has spread from manufacturing industries to building design. The idea is that a designer can plan ahead for methods of efficient and environmentally safe methods of disposal when a building's life cycle ends. Materials and their environmental impact are being considered more fully by most design practices. BDP itself is developing



Far left: the Lanes shopping centre at Carlisle an example of modern construction using atria by BDP and an RIBA award winner
Left: another BDP atrium at Ealing Broadway giving daylighting and passive solar energy for heating.



Above: continually tuning building design with Oscar Faber's link to the energy management system at the Royal Bank of Scotland

policy documents aimed at pressurising manufacturers for safer products. "BDP has over £1 billion-worth of business. With that kind of buying power, if you can't make a statement, there's something wrong," says Mills.

Growing numbers of building design consultancies are using their expertise to develop green building techniques. One such firm is the ECD Partnership, formed in 1980. ECD (Energy Conscious Design) undertakes both architectural and energy consultancy work with clients ranging from commercial and domestic developers to UK government and the EEA. Senior partner John Doggart says ECD's first concern on any job is to reduce energy requirements—typically by around 40%.

"To achieve a low energy building we use very good insulation, face the building south if appropriate, incorporate high efficiency boilers and avoid air conditioning if possible." ECD now installs evaporative cooling systems rather than those based on refrigeration, and insists on timber from sustainable sources rather than tropical hardwoods.

A milestone in ECD's earlier work is the award-winning Spectrum 7 building. It is sited in the Milton Keynes Energy Park, which is itself promoted internationally by the town's de-

velopment corporation as a project to demonstrate energy efficiency.

Spectrum 7 was designed to respond to its location, local environment, and microclimate. The elevated, insulated roof with northlights admits daylight but reflects unwanted solar gains. A concrete floor slab contains cooled water pipes for summer cooling, while the side walls are clad in a panel system which can accommodate changes to the window arrangement if required; the roof here gives shading, with overhangs. Doggart is adamant about the energy issue. "It's estimated that our energy demand will rise sevenfold by about 2040—but we have to make a 50% reduction on what we're using now. I suspect this is one of the biggest jobs this world is taking on, both politically and technically."

Labelling

Green labelling for buildings is set to become a reality this month, through a joint effort between ECD and the BRE. The self-financing scheme will use independent certifiers examining proposed buildings at the design stage, vetting them under a list of specific environmental criteria. Doggart sees it as a positive step to 'greening' the building market. "Consumers are increasingly concerned

about the environmental effects of products they buy, while buildings are hardly considered at all."

He also reckons there will be a clear marketing advantage to be had for designers and clients alike from proving a building to be environmentally sound. A green label would be practical proof of steps taken to achieve an 'environmental charter'. Integrating high technology into buildings can have tremendous effects on the energy efficiency, leading to what is known as the 'intelligent building'.

Sophisticated energy monitoring systems are becoming commonplace on large developments and a recent breakthrough occurred with Oscar Faber's remote system. Installed in 1986 in the £30 million Royal Bank of Scotland development in Islington. The electronically-controlled building systems are linked via BT Kilostream line to a computer at Oscar Faber's St Albans office. A weather station on the roof in Islington feeds meteorological data via the building systems to the computer which then compares the system's performance against a model of the thermal characterisation of the building envelope and the prevailing weather conditions. It has achieved energy savings of around 10%. **46 ▶**

Doug Oughton, Director of Oscar Faber's Consulting Engineers division, thinks this shows a case for extending the duties of the designer beyond contract completion, to participate in the initial period of plant operation, allowing the full training of the clients' own engineers to run the systems at peak efficiency. "Design is only part of the jigsaw," he says. "Even with a well-designed system, its economic running depends on the building service engineers' ability to understand and operate it effectively."

Continuity

The term 'green building' has become very fashionable of late, and has been subject to a fair amount of media hype. Seasoned building professionals point out that it is a tag applied to a design approach that is neither new or revelatory. David Lush, Technical Director of international firm Ove Arup defines the term as "just inherently good design. If you use all the elements of the design process well, you'll have the next best thing to a so-called green building." Lush stresses that, in the current attention

to environmental issues, the importance of health aspects to building users must not be overlooked. "Health is important, and we should be looking at how we specify the internal environment of buildings—there are still some pretty traditional parameters being adhered to." He refers

specifically to Sick Building Syndrome (SBS). "Spectroscopic analysis identifies at least 100 gaseous contaminants such as vapours from resins and glues in furniture. What we don't know is how people are affected in the long term by these substances. Air conditioning is often blamed, but SBS occurs in non-AC buildings too." Green issues aside, Lush believes in the importance of efficient buildings per se. "This has been important before the environmental lobby started." New, 'greener' building regula-

tions come into effect this month, concerned mainly with increasing provision for thermal insulation. "The change is aimed to improve the energy efficiency for new buildings," says Tony Field of the DoE's Construction Directorate. "We estimate they should increase efficiency by an average of 20%."

The new regs allow some flexibility as to how standards may be achieved. "They allow the designer to take more adventurous routes to achieve the same end," says Field.

The detailed legal requirement of conservation of fuel and power is changed to a simple functional requirement that "reasonable provision shall be made for the conservation of fuel and power in buildings." This simplification is receiving a fair degree of criticism. Some see it as a half-measure from a government tied to a laissez faire, free market philosophy, while others voice concerns over a possible opportunity created for corner-cutting on standards.

"My committee is saying that the new regs don't go far enough in terms of energy," says Professor Peter Smith of Leeds Polytechnic's Energy Research Unit, who advises RIBA on energy matters. While believing the new regs are "more sensible", he says "they do leave potential loopholes. Standards can be traded off—you only have to achieve a certain overall insulation value."

Lush at Ove Arup would prefer the new regs to include specific requirements. "If you really want energy-efficient regulations to bite, then you have to be very stern about what you want." The changes are generally regarded as inadequate by those who think Government should take a stronger lead on the green building issue. "There's a singular dearth of initiatives from Government," says Andrew Warren, Director of the Association for the Conservation of Energy (ACE). "The changes are a step in the right direction, but the difficulty lies with setting standards for existing buildings." Warren expresses concern about heating systems and controls, areas untouched by the changes. "The point is, it's the only thing that's happening." Warren agrees with Professor Smith in that

there should be standards set along the more stringent lines of the Scandinavian countries—"the ones we have now are equivalent to those in Sweden in the 1930s," says Warren.

Building professionals agree that a multi-disciplinary approach is needed in the design area for more environment-friendly buildings. Education is crucial to this end. "It's the exception rather than the rule to find an energy-literate architect," claims Warren of ACE. He believes this poses problems for building services engineers, although he concedes there is a change taking place, with RIBA and some schools of architecture making moves on training.

Developments

Professor Smith of Leeds Polytechnic is working closely with RIBA on just this issue to produce a core syllabus for training. "We are concerned with Continuous Professional Development—post qualified learning—and are producing packages on energy and environmental design issues." He sees CPD becoming obligatory over the next couple of years. "I have to acknowledge that the profession generally has not taken the energy and environment matter seriously enough, partly because developers themselves are not often interested. They want to get a building up as cheaply as possible." Free market economics and environmentalism do not appear immediately compatible. David Lush, who recently delivered the lecture 'The Architect, Energy, And The Global Environment', says altruistic effort can achieve little by itself in a competitive economy that usually regards cost as a deciding factor. Green building needs encouragement from mechanisms like statutes, financial inducements, green labelling and tax breaks to make it work.

Professor Smith has five points of his own he believes need swift action:

- UK insulation standards by 1995 should match the current Danish ones (Danish building practices are similar to those in the UK).
- Minimum efficiency standards to be introduced for all appliances.
- Buildings to be graded according to their energy efficiency, with log-books supplied (as in Scandinavian countries).
- Coal-fired power stations to be replaced by phasing in gas turbine ones (which are twice as efficient).
- The government should contribute to renewable energy resource research and development.

Smith is emphatic about the need for buildings to go green: "In my view, the market on its own will not achieve changes on its own quickly enough if we are ultimately to save the planet."

*Mike Yuille is a freelance journalist



Above: inside the BRE's low energy office building

Right: the exterior of the low energy office at Garston, Watford

