The Green Building Temple Bar Dublin a valuable stage in the development of green architecture?

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B.Des.

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The Green Building Temple Bar, Dublin/a valuable stage in the development of green architecture?

by Gerard Doherty

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Introduction

Environmental degradation is well documented; the idea that architects and designers should consider the environmental impact of their work is not new. Twenty-four years ago Victor Papaneck argued that designers were in a powerful position to help create a better world or contribute further to planetary destruction(Papaneck, 1985). When the book was first published, environmentalism and the idea of sustainable development were considered the domain of a radical fringe. Today, because environmental degradation is causing public concern, governments are finally displaying their environmental credentials. An area that has recently been addressed is the built environment. Buildings are responsible for more external pollution than any other product. The green house effect is a natural phenomenon which to a large extent governs the daily and seasonal temperature balance of the world. It is caused by gases in the lower atmosphere absorbing infra-red radiation. These gases occur naturally but concentrations of many of these gases have increased due to human activities, to such a degree that there is now widespread conviction that significant climate change may result. An estimated main contribution breakdown of global warming is as follows;

Carbon Dioxide 50%,

Methane, 19%

CFC's 17%

Tropospheric ozone 8%

Nitrous oxide 4%, (Hardwick, 1990,p.12)

Global warming has increased by one percent every two years, it has finally reached a point where insurance companies are altering their premium calculations because of worrying climatic changes (Mc Kenzie, 1991,p.150). While Carbon Dioxide is produced naturally by a variety of mechanisms, the combustion of fossil fuels has led to a rapid increase in the concentration of Carbon Dioxide in the atmosphere.

The building industry has had a major impact towards Carbon Dioxide emissions in three ways: firstly, by purchasing large quantities of timber for use during construction. This leads to the destruction of forests that played a vital role in maintaining the natural Carbon Dioxide balance. Secondly, large quantities of Carbon Dioxide are emitted during many of the manufacturing processes involved in the refinement and production of materials and components in the building industry. Thirdly, the consumption of energy when the building is in use. The energy used in heating, ventilation, lighting and other services in buildings accounts for approximately 50% of man-made emissions of Carbon Dioxide, the main green house gas. Currently energy consumption in modern offices in Dublin alone results in annual emissions of over 95,000 tonne's of carbon dioxide (Hardwick, 1990,p15).

To improve the situation, the way in which we build in the future is extremely important. Renewable energy technologies have been in use on a limited scale for over forty years. In Ireland, the National Microelectronics Research Centre at Cork, has in operation a project showing the viability of photovolvic modules in generating electricity. This project has been supplying power to domestic residence in Farnanes, Co. Cork since 1980. However, until recently, research budgets for the development of these technologies were not adequate. To take the E.U. for example, by 1991 twenty times as much research and development funding(two hundred and forty million E.C.U) has been allocated to nuclear fusion, financing a technology that has proved unreliable as has gone into a whole range of successful renewable energy projects (Hardwick, 1990,p21).

The Thermie Programme was initiated by the European Community in June 1990, concerned with the promotion of energy efficient technologies throughout Europe. The project partially financed innovative technologies but, central to its propositions was the production of a building that was commercially viable and whose design philosophy and performance would be distributed throughout the E.C.

"For the purpose of this regulation, projects for the promotion of energy technology, there in after referred to as projects designed to advance, implement and/or promote innovative technologies in the field of energy, implementation of which entails a large element of economic and technical risk, such that those projects would in all likelihood not be executed without community financial support." (Official Journal no L185, article 2, p.3).

The initial concept for Dublin's Green Building was first proposed in 1990 by Tim Cooper the Director of Buildings, for Trinity College, Dublin and Owen Lewis, Director of the Energy Research Group at University College, Dublin' s School of Architecture. The project remained at the planning stage for some years until Temple Bar Properties undertook to develop the project. A catalogue of events unfolded until the project was finally realised in April 1993 with the help of the E.C. Thermie Programme and the architects Murray O Laoire. From the outset the building was intended to pose archetypal and prototypical characteristics: archetypal in that it would reflect the historic European urban tradition and prototypical in that it would be used to test and monitor passive solar and green principles within the building industry. This project would serve as a 'flagship' for energy technologies that act against global warming and could provide developers and designers in Ireland and the E.U. with practical demonstrations of the viability of those technologies employed (fig.1).
Until the Green Building in Dublin, attempts within the EU at reducing environmental impact have tended to stand alone as separate experiments and were seen as once-off efforts to show green architecture. An example of one of these type of projects is the Spectrum Seven Building in Milton Keynes. Designed in 1985 by E.C.D. Partnership in London (fig.2) it is part of a major housing development that explores various ways that promote energy efficiency. The building maximises one design parameter solar power, it admits daylight through its well-insulated roof and has a front elevation that is fully glazed.

The Green Building (fig. 1)

The Spectrum Seven Building (fig. 2)

The Green Building in Temple Bar is ultimately about balances, it does not set out to maximise one design parameter as the Spectrum Seven Building has shown, but to integrate the ideas of energy efficiency into a conventional building. It stresses the need for a holistic approach to resource management while addressing the main areas for change. These are the reduction of a building's dependence on fossil fuel through alternative energy sources and the use of materials that have a lower environmental impact.

The Green Building in Temple Bar does this in an accessible and commercially viable manner.

This thesis will outline the various developments made by this building in contributing to energy conservation within the built environment. Although the building radically displays the merits of the green approach to architecture throughout the building, there are other areas in which this project has contributed to the advancement of the green approach to building in Ireland. The Thermie Programme's main objective is to help innovative energy-saving technologies gain market acceptance. This thesis will also look at the problems involved with the introduction of energy saving methods into the built environment.

CHAPTER 1

Dublin's Green Building is situated in the heart of the city centre in one of the oldest parts of the city whose layout is reminiscent of the medieval Dublin before the laying out of formal Georgian streets from the mid eighteenth century onwards. In the Seventies the state transport authority, Coras Iompair Eireann, acquired property in the core of Temple Bar for a proposed transport centre for the city. These plans met with considerable opposition and the resultant blocking of planning permission in effect preserved many of the older buildings. These buildings had fallen into a state of disrepair and were neglected and rapidly decaying so the resulting low rents gave rise to a variety of uses. Temple Bar Properties was formed with the aid of Government and European investment in order to redevelop the area. Temple bar properties took over the substantial former C.I.E. holdings in the area. Critics of the Government's involvement insist that this was a move to institutionalise the informal and essentially spontaneous nature of Temple Bar. A Project like the 'Greening of Temple Bar ', providing a recycling and waste management programme, is seen as a superficial colouring experience to disguise the destruction of some of the older buildings. The scheme was controversial from the outset; redeveloping the area could have meant the people who brought life to Temple Bar would be driven out, leaving behind a shallow touristic showcase, 'The Convent Garden Syndrome', described by Paul Leech in a critique of Temple Bar Properties' redevelopment plans (The Green Building, no103, p28). The Green Building forms the root of Temple Bar Properties's redevelopment policy.

Its design is drawn from the results of a nine-year study beginning in 1984 on energy conservation technologies at Trinity College, Dublin. Finding a way to reduce the harmful effects this building has on the environment has led to two contradictory directions: the development of highly sophisticated technology to help control and monitor the conditions inside the building and the use of natural simple features to make sure the building makes best use of the location. To implement these simple features in the building uses two broad approaches; the first aims to reduce the effects of the external environment through the use of good insulation and controlled ventilation; the second is to use directly the effects of the sun and natural ventilation to minimise the need for heating and cooling systems.

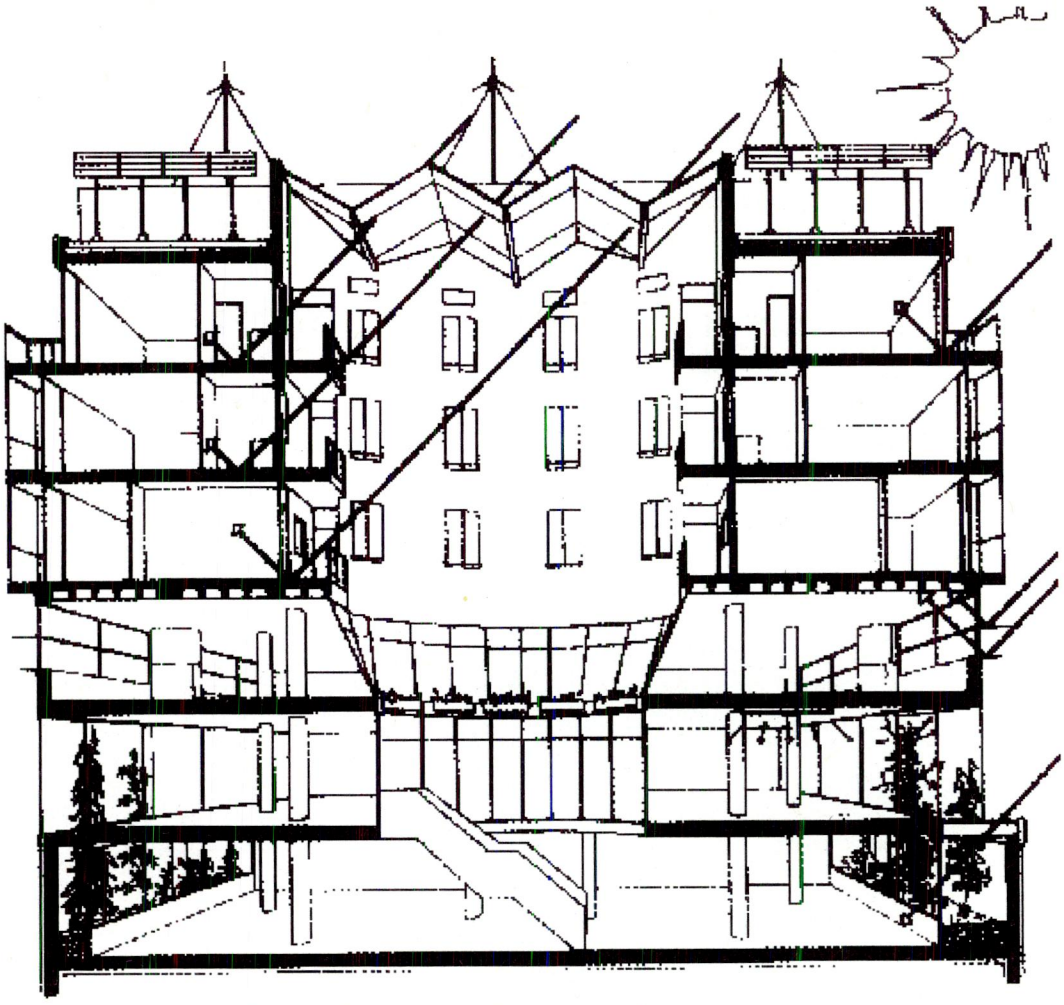
Temple Lane (fig. 3)

The constraints imposed by the site made trying to demonstrate the merits of active and passive heating and ventilation systems difficult (fig.3).

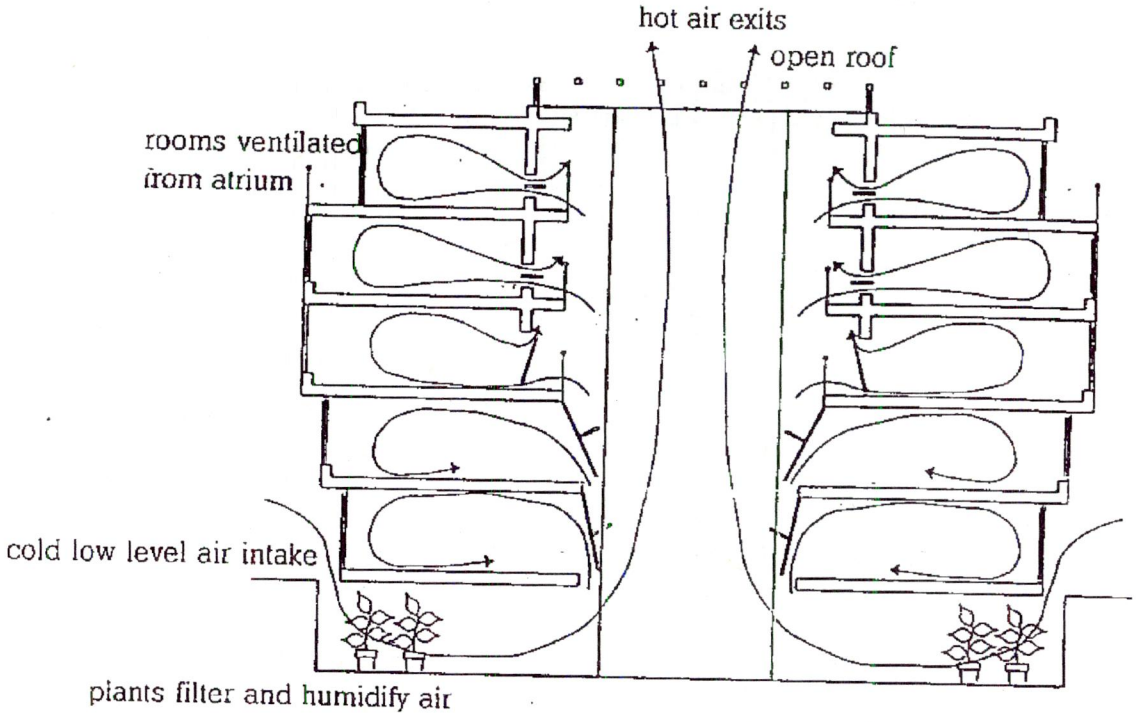
The site is a twenty six metre long double plot with eleven metres at the front and back entrances. Unlike the Spectrum Seven Building that makes best use of the south façade, because of the constrictions imposed by the site, the Green Building can only take advantage of passive solar light and heat through its roof(fig4). However, these constraints could reflect any urban location thus adding to the demonstration purposes of the project; if this new attitude towards building can be expressed here and it works, it can be applied anywhere. The Green Building's structure is laid out around a six storey central courtyard and incorporates shop units on the ground floor and basement levels, offices on the first floor level and eight apartments on the upper three levels. The building is constructed in massive form to prevent its being affected by short term variations in weather conditions and it is encased in an insulated cover that opens automatically during mild conditions. The system is controlled by taking into account the weather conditions for the following day, which are forecast by transmission via modem from Trinity College. A large central sun space is provided, containing planted areas that naturally maintain the humidity levels, refreshing the air and bringing sunlight to the core of the building. A study of sun space planting at the O'Reilly Institute at Trinity College outlined that the plants used will be capable of filtering most of the carbon dioxide emitted by the building's occupants(fig5). This, in turn, will reduce the amount of outside air needed for ventilation in winter, thereby reducing heating energy requirements. In order to maintain the central space in the courtyard, the lift is constructed as a free standing structure allowing for maximum light penetration.

By monitoring the Green Building there is constant feedback on the building's state. An example of this in the building are the carbon dioxide sensors making sure there is enough fresh air circulating. If the carbon dioxide level is too high, the building responds accordingly. Ventilation is also provided by drawing the air through large conditioning chambers filled with specially selected plants at street level(fig 6 &7).

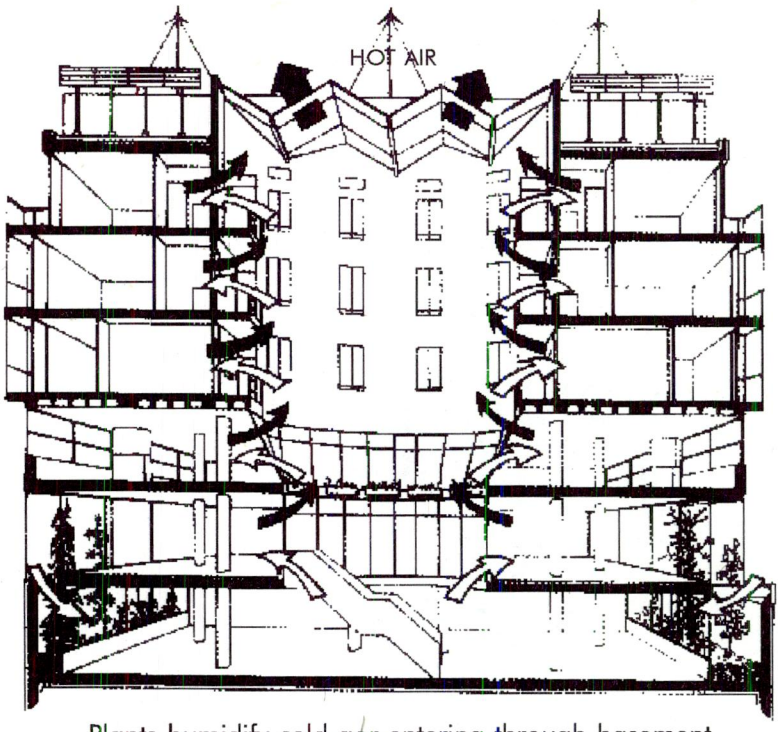
Ventilation using cool air driven through the building by naturally occurring differences in wind or air pressure will only be effective in practice some of the times, in conditions of heavy air and humidity the system will need help to keep the air circulating.



The use of passive solar light in the building (fig.4)

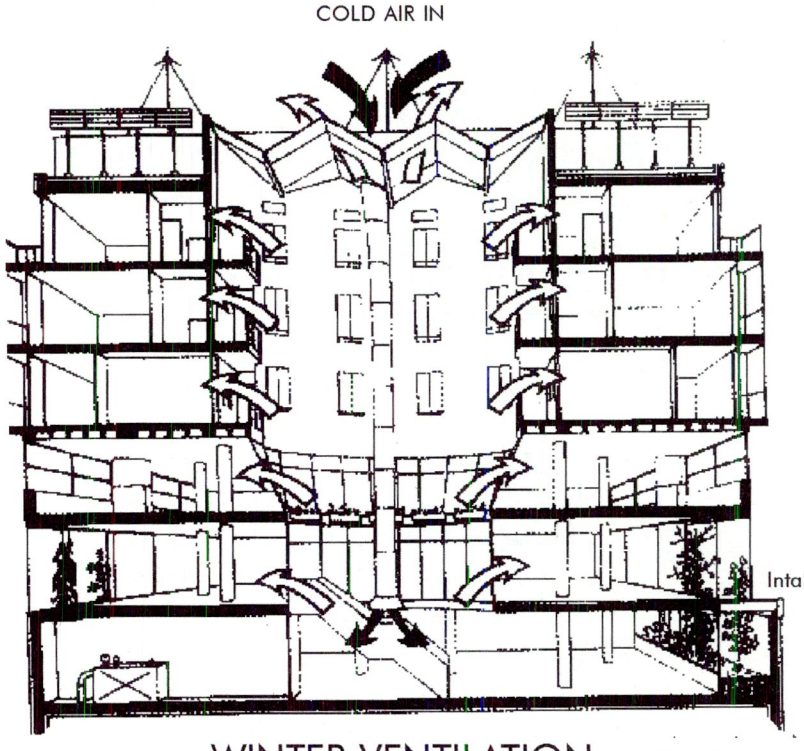


(fig.5)



Plants humidify cold aor entering through basement

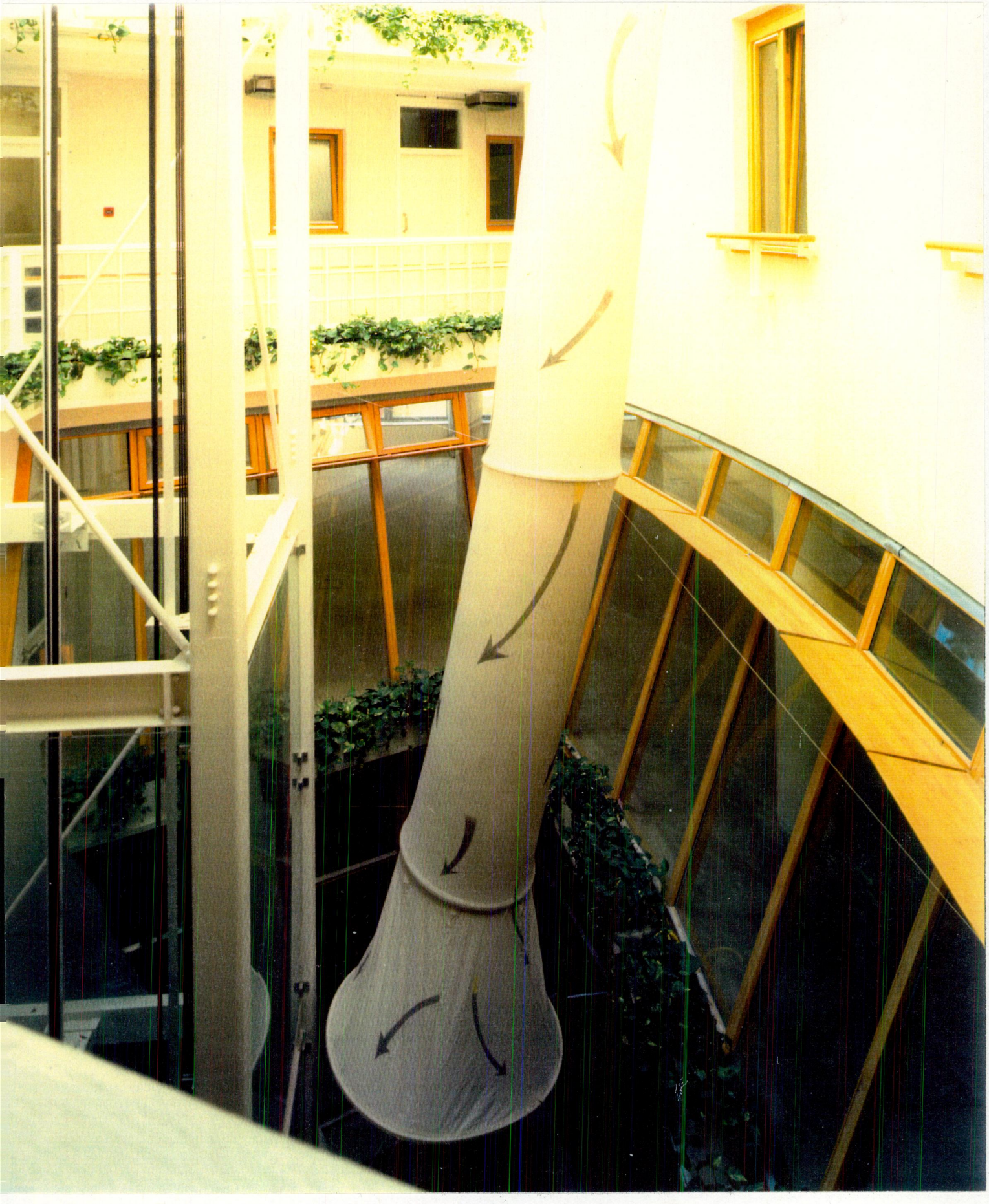
SUMMER VENTILATION (fig. 6)



WINTER VENTILATION (fig. 7)

The building uses a fan unit with a visually explanatory fabric funnel designed by artist Vivienne Roche(fig9) to help the system. Perhaps this is one of the best examples of how a passive system can be used in conjunction with conventional ventilation systems. This is an example of the clever and appropriate use of technology often slammed in at full capacity. The active solar heating system consists of four photovoltaic panels on the roof, coupled with two wind turbines; these provide the building with sufficient power. Electricity is stored in batteries in the basement to be used in calm or overcast days. At the ground floor level a waterfall flows into a pool; this provides a dual purpose in that it humidifies the air and provides accoustic white noise. The walls of the building are covered with one hundred millimetre thick insulation of rock wool and masonry concrete, making them into a solid mass. Unlike conventional buildings the insulation is placed on the outside and is finished with a coloured plaster render. By doing this, the wall's U value (thermal conductivity) is greatly reduced; they in turn act as storage heaters in winter and like the walls of a cave in summer.

Perhaps the best way to describe the underlying principle in the building's design can be found in Stephen Groak's description on comparing a climactically responsive building to Edward de Bono's ideas on the design of the Wright Brother's aircraft (Groak, p28) The Wright Brothers could produce the first flying machine to fly by designing one that could not fly. Until then designers sought an aerodynamic shape that would remain stable under whatever conditions during flight. The Wright Brothers recognised there were too many conditions likely to arise during flight, too many conditions to be met by a one shaped solution. They devised a shape of variable geometry using wing warping and an adjustable rudder so that the machine could change shape under different conditions. The machine was thus in unstable equilibrium and was constantly corrected by adjusting the wing tips or rudder through feedback on its own behaviour. When this is applied to the built environment it can be seen as a real solution for designing a truly environmentally aware building; The idea that a building is an unstable system can be seen throughout the Green Building. It can be constantly adjusted to take advantage of the external environment or, alternatively, steps taken to counteract these effects.



Fan funnel designed by vivienne Roche (fig. 9)

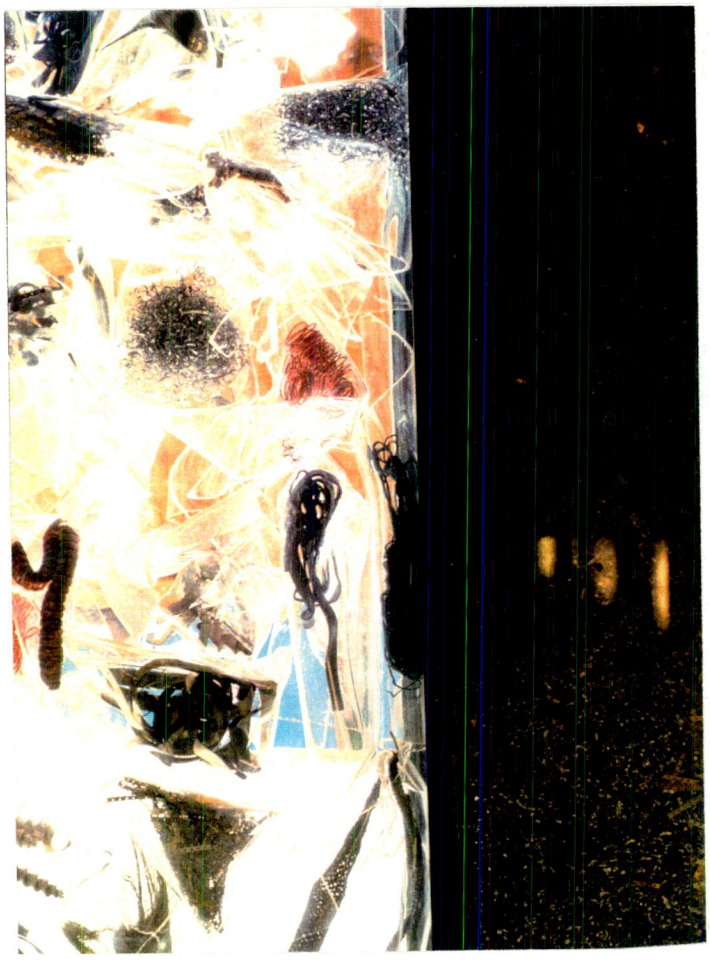
Heat is provided from a heat pump; at night hot water from the bedrock, one hundred and fifty metres below, is pumped into an insulation tank for release during the daytime. The system is controlled by computer, which can receive and use weather forecast data; the amount of hot water needed for the following day is stored and is then pumped through a network of pipes embedded in the structure, to heat the building. It was hoped to find a geothermal spring at a depth of five hundred metres. Geological tests carried out in the grounds of Trinity College located a geothermal spring; the Green building being a short distance from Trinity, it was hoped to locate the same spring, thus providing the building with its heating requirements. This proved unsuccessful as granite at a depth of one hundred and fifty metres prevented the Architects from drilling further to locate the spring. Monitoring alone will reveal the effectiveness of this compromise. Approximately 80% of the energy needed to heat the building will come from the bedrock. The balancing 20% needed to power the heat pump comes from low cost night rate electricity. Most of the electricity used in the building comes from solar panels and four wind turbines on the roof. Each turbine is capable of generating up to 1,500 watts, some of which is stored in batteries to be used in calm or overcast weather. The electric lights use advanced energy-efficient technologies designed to complement day light. High frequency fluorescent lamps will provide background illumination of 160 lax; higher levels of work surface lighting will be achieved by the use of high efficient task lighting. Materials chosen in the building were selected on the basis of minimum environmental impact of raw material production and manufacturing processes. Considering the standards set in assessing their suitability, it is not surprising that sourcing the suitability of materials was difficult. Both manufacture and usage require energy and so a balanced judgement of the merits of a material could only be made on the basis of a broad environmental audit, increasingly referred to as the lifecycle analysis or the 'cradle to grave' approach.

An example of the criteria expected of the materials used can be seen in the windows made from softwood from managed renewable plantations in Ireland with water- based, solvent- free paints. The windows used were chosen because of their lower thermal conductivity over conventionally double glazed windows. The air gap between the windows is filled with argon (less dense than oxygen)and are designed to minimise thermal bridging. There were however some materials in the building for which there were no 'green' alternatives. It was hoped to use recycled concrete, but this proved unsuccessful; the amount of energy needed to break down concrete and re-use it as an aggregate would not make this feasible. The use of steel, one of the most environmentally damaging of all the materials used, through its extraction and its manufacturing process, was kept to a minimum.

One area this project highlighted was the need for a proper labelling system regarding energy efficient materials and products. Architects and designers, when sourcing materials for this project were confronted with grossly misleading claims from manufacturers who marketed their products as green(Cooney, Interview, 25/10/94). In one case a manufacturer was marketing his product as recycled; on closer inspection it was found to be refined aluminum. This is twice as bad, as the energy used in the manufacturing process is doubled. The information available to architects in designing a building of this type is inadequate. One of the main contributions this building has made to future projects is that it has highlighted the need for an independent guide for designers to source green materials. There are plans for such a directory, but, because it is a huge undertaking its success will depend on how much European funding is made available for the scheme. Material specification should form the first stage of the integration of the Green theme into the building industry. Using standard materials that have a lower environmental impact represents a major change in building practice, although this building demonstrating that Green design does not have to mean a radical change from well-tried building methods. It demonstrates how standard materials can be used to increase energy efficiency. An example can be seen in the insulation wall: in order for them to retain heat more effectively, they are constructed with the insulation on the outside and concrete on the inside.

This approach, of reinterpreting the uses for materials, is used extensively. Another problem with using Green materials is the extra cost involved. In most cases, they are more expensive than materials or products generally in service. Building materials that have a lower environmental impact are usually marketed as subsets of existing products. Examples of this can be seen in the paints used. The brief outlined the use of organic paints but the total cost quoted was a 50% premium above the price of conventional paints. Research has shown that in order for a product to gain market acceptance it must be better than what was gone before(Mc Kenzie, 1992, p.175). The building industry, as with other manufacturers wants the same or better performance, but not at a higher price. Although at the planning stage it was hoped to use more energy efficient materials, the nature of the brief to produce a commercially viable building meant some features that were to be included like a recycled copper roof, were dropped in favour of a cheaper alternative.

The use of recycled materials can be mainly seen in the art and craft element incorporated into the building's façade. While the use of recycled and environmentally friendly materials was fundamental to this project, the architects, Murray O Laoire were concerned to go beyond tokenism in the integration of art and craft elements in the building. This is a novel approach as the inclusion of art in a project is usually commissioned after the project is completed rather than being conceived as part of the overall design. The Temple Lane entrance by artist Maud Cotter(fig 8) is a multitude of twisted metal and found objects trapped behind glass that rises up to the first floor. The façade with its recycled copper water cylinder cladding on the oval columns and recycled bicycles used in the balustrades designed by James Garner at the Crow Street entrance has given the building a focal point and a sense of identity which might have been overlooked given the traditional approach to the buildings design. The building is a showcase of contemporary Irish design with its urban chic, kitchens designed by Taigh O' Driscoll built around a tiled worktop and a salvaged Belfast sink(fig9), while the use of recycled television screens as light fittings(fig10) is an outward display of the imaginative approach taken in the building's design. The successful integration of art and craft elements into this building presents a stronger case for artists and designers to lobby successfully for a one percent share of building development costs.



Temple Lane enterance
Maude Cotter (fig. 8)

Kitchen units by Taigh o Driscoll (fig. 9)

A recycled television screen used as a light fitting (fig. 10)

The building as a showcase for contemporary Irish design.

Chapter 2

"If the problem of the dwelling or the flat were studied in the same way that the chassis is, a speedy transformation and improvement would be seen in our houses, if houses were constructed by industrial mass production like chassis, unexpected but sane forms would soon appear and a new aesthetic would be formulated with astounding precision".

(Le Corbusier, 1927)

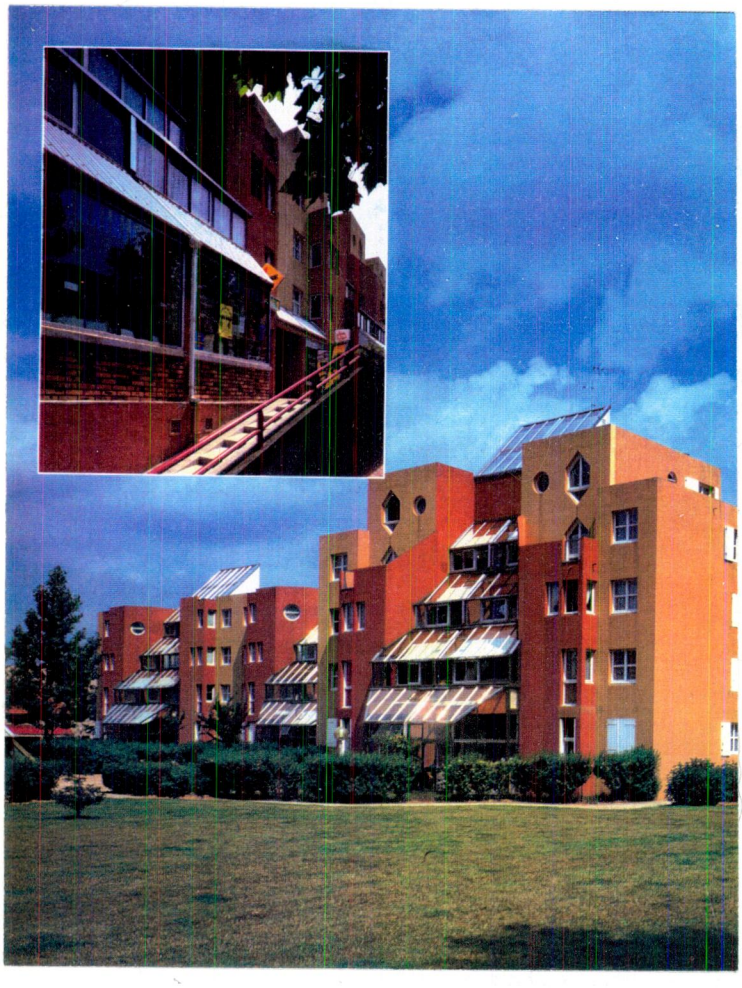
The Green approach to architecture is not a new approach. It has existed since people first selected a south facing cave rather than one facing north, to achieve comfort in temperate climates. What is new, and what the green building is trying to demonstrate, is the realisation that a green approach to the built environment involves a holistic approach to the design of buildings. All the resources that go into the building, be they materials or energy saving technologies or the contribution of the user, need to be considered if a sustainable architecture is to be produced (Cooper, Interview19/1/94). Architecture of the past has been associated not with the production of shelter but with the expenditure of resources for a particular stylistic effect. It was an indication of how society viewed itself. How it attained these resources was unimportant. This is consistent with the views taken by architects today; environmental considerations in most cases are confined to function and appearance while little attention is given to the impact construction methods and materials or, for that matter the energy efficiency of lighting systems have on the environment.

Before formulating the brief, the planners and developers reviewed various buildings over the past four hundred years for ideas on how older buildings performed. Tim Cooper, in his research carried out in Trinity College found that older buildings were energy efficient in their construction, however over time, with the addition of modern appliances the heating systems and ventilation, energy efficiency was reduced substantially(Cooper, Interview, 19/1/94). This is an example of how architects and designers have disregarded previous values established over time and replaced them with new 'ideal' solutions using advanced technology.

Cooper takes the Irish Cottage as an example of a highly energy efficient building:
"The form of the Irish Cottage is one of the most Green designs using local materials, it has huge thermal inertia, the wall to floor ratio is as low as you can get, the roof is from natural organic materials, wood and straw it is exceptionally built in terms of thermal inertia".
(Cooper, Interview, 19/1/94)

This simple approach to designing an energy efficient building is what gives the Green Building its appeal. Although it is a radical demonstration of the environmental nature of architecture it seeks to demonstrate this within widely accepted architectural conventions: Its ordinariness is intended to encourage others to follow suit. The common perceptions of 'green' energy efficient building as being associated with muesli eaters and bicycle riders and passive solar being associated with gizmos and applied technologies have been firmly laid to rest in this building. The architects were at pains to point out that their intention was not to design a' flagship' for Green Architecture that stood alone as a once off-attempt at energy efficiency but to reflect an attitude toward materials and resources within an ordinary building(Cooney, Interview, 25/10/94). This building is ultimately about balances: it does not set out to maximise any one design parameter. The image of an introverted massive building with minimum window apertures proclaiming only energy efficiency was disregarded in favour of a total balanced view of the architectural potential of bio-climatic principles. This is best seen when comparing this building to other environmentally aware buildings. One such building is the headquarters of the NMB bank in Amsterdam 1990(fig11), considered the most energy efficient in the world. While using similar principles to Dublin's Green Building, concrete mass as heat storage, natural ventilation, solar panels, the architects have, through its sloping walls and dramatic appearance, displayed that this is an unconventional building. Although it was designed under dissimilar circumstances than the Green Building - i.e. needs of the client, the idea that green architecture is different is highlighted. Another example of a previous attempt by the EC to monitor energy efficiency in buildings is Les Garrennes(fig12), a housing development in St. Quentin en Yvelines near Versailles in France. These apartments are designed to make best use of passive solar heating; the illustration shows how the south face has been adapted through the use of glass to make the best use of the sun.

NM B Bank Amsterdam (fig 11)



Les Grannes,St Quentin enYvelines
Versailles, France. (fig. 12)

Its striking appearance is typical of energy efficient architecture. Although it is highly energy efficient, the architects here, and in the NMB buildings, propose a green aesthetic; in doing this green architecture is in fear of becoming another style or mode of fashion.

"The quest for an all encompassing architectural style no longer controls architecture We now live in a pluralist age" (Maggie Joy, Minimalism In Architecture, Aug 94, p.7)

Although the Green Building tries not to propose a new style for green architecture, it is guilty of using token gestures of a green aesthetic. An example of this is the country cottage style kitchens(fig9) used in the flats in an idea consistent with mainstream thinking that green design is inevitably going to be traditional in category and style. There is no reason why greenness should be synonymous with a natural appearance. During the initial stages of environmental awareness, the concentration on a natural green aesthetic was understandable given anti-consumerist ideals. However as green ideals filter through the majority of products, the green aesthetic will become as diverse as peoples tastes (Whitney, 1993,p.52).

It has been seen that one of the underlying principles of the green approach to building is that it should be adaptable to change. The perception that buildings are stable and permanent is a widely held view in society. When they are viewed over different time scales, a different picture emerges. Over its lifetime a building may have various uses and should be adaptable, to facilitate its various social uses, while provisions should be made for it to be flexible and capable of different physical arrangements. Buildings of the past were built to impress and endure; however, as time has shown this built in obsolescence characteristic has proven costly and ineffective. This can be seen in the wide scale demolition of buildings in the Sixties and Seventies. An example of an architecture planned to facilitate change can be seen in the Shaker communities of North America which designed buildings to respect rather than override the environment using locally available materials; they built their houses larger than was necessary to allow expansion without inconvenience. This evolutionary approach reduced the amount of redevelopment that disfigures so many communities. This system of architecture could be altered and readjusted over the years.

Their style of building in some ways reflects Frank Lloyd Wright's principles of the natural building, where his concept of organic architecture not only meant that design that worked with natural conditions but that design was also a living organism. Because it was living, he believed no organic building could ever be finished.

Is the Green Building a model of adaptability for planners and developers?

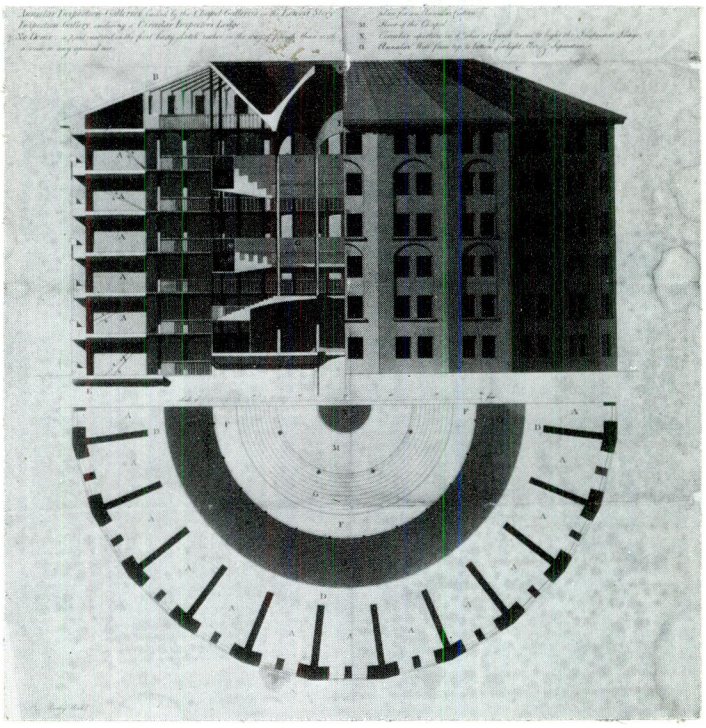
The area in which this building is located makes expansion difficult, however the underlying themes of this building can be adapted for use in other developments. The fact that the building was designed and built without preselling the spaces is an indication of the success of this building in facilitating different social uses and internal arrangements.

The success of any environmentally aware architecture depends on how early in the planning stage the ideas of energy efficiency are incorporated into the building's design. A characteristic of natural systems is that there are several uses of the same element. The architects, Murray O Laoire, have integrated the central courtyard as an air chamber, pedestrian circulation device, and light well. Another example can be seen in the water borne- heating system which can also be used as fire sprinklers. This combining of elements can be seen throughout the building; the battery pack charged by photovoltaic and wind chargers is used for lighting and also for emergency standby. It even goes as far as the drainage systems so rainwater from the roof and used in the bathrooms, wcs, and showers so nearly two-thirds of the estimated demand can be met. This is another area in which the ideas used in this building's design could be incorporated into standard building practice. The building demonstrates how these various methods can be employed in conjunction with conventional building practices.

Chapter 3

The close connection between energy use and environmental damage caused by buildings arises because far too often architects have looked at technical solutions to meet energy needs. In doing so, buildings rely on mechanical systems to solve climate- related heating, cooling and lighting problems. This is often attributed to inadequate design (Lewis, 1992, p 23).
The technology used in the Green Building is relatively simple because of the nature of the project. There might have been a temptation to include sophisticated energy saving devices, however considerable restraint was used in the integration of the various technologies into this building. The building is continually being monitored, enabling designers to rapidly and accurately evaluate the performance of the building's air temperature, air movement, relative humidity and lighting levels. With this system in place, the various energy- saving techniques can be assessed. Although the system has only been in operation for four months, the results have already proved invaluable to designers for future projects. It can decide the amount of energy used by individual appliances; for example, the electricity used in extractor fans in bathrooms was found to be excessive, so with this information designers are developing new ways in which bathrooms can be naturally ventilated. The architects use of technology throughout the building is an example of how this can be used sensibly and in the background, to aid the natural features in the building. The application of information technology in controlling buildings is not new. In the Sixties, Californian hobbyists built rooms to house bulky computers to run their houses. Its use in buildings has come under constant criticism, is it really needed? The fact that the technology exists is not enough to create a demand for it. Energy management systems have been described as exercises in control using technology and as infringing on the building's occupant's lifestyle. Dr Ian Cooper in his paper, Energy Conservation in Domestic Premises (Cooper, 1980 p.68) reviews the British Government's introduction of energy management systems into their buildings. Energy management systems(E.M.S.) are microprocessor-based products which allow fuel consumption and the internal environment to be monitored. He compares the system to Jeremy Bentham's design for a panopticon in 1778, a design for a prison in which those in charge could control the prisoners from a central position (fig13).

Bentham, a radical social reformer, designed the panopticon in which a large number of people could be supervised and kept under constant surveillance using the minimum amount of supervision. Dr Cooper draws a parallel between this form of architecture and the pursuit of the modern equivalent through information technology. The similarity between Bentham's penopticon and the governments introduction of E.M.S. can be seen as money- saving projects. The system displays the same lack of trust in the building's occupants as Bentham's surveillance through the internal arrangement of his panopticon. In summing up, he states that energy management systems are designed to protect sectional interests at the expense of the occupants. This view might appear radical, however these systems are still seen as no more than exercises in power(Cooper, 1980, p.69). In designing the Green Building, care was taken to allow free choice for the user at all times. Although the ventilation system used in the building relies on small variations in pressure to move the air through the air chambers, the user has the choice to open the windows if s/he wishes. The architect's view is that energy saving technologies should be used in the background but for them to be successful the user should not be aware that these systems are in operation. The Green Building has succeeded in demonstrating that incorporating energy efficient technologies into a building will not mean a radical change in lifestyle; this alone should increase the market potential of energy efficient technologies.



Jeremy Benthams Panopticon (fig. 13)

Chapter 4

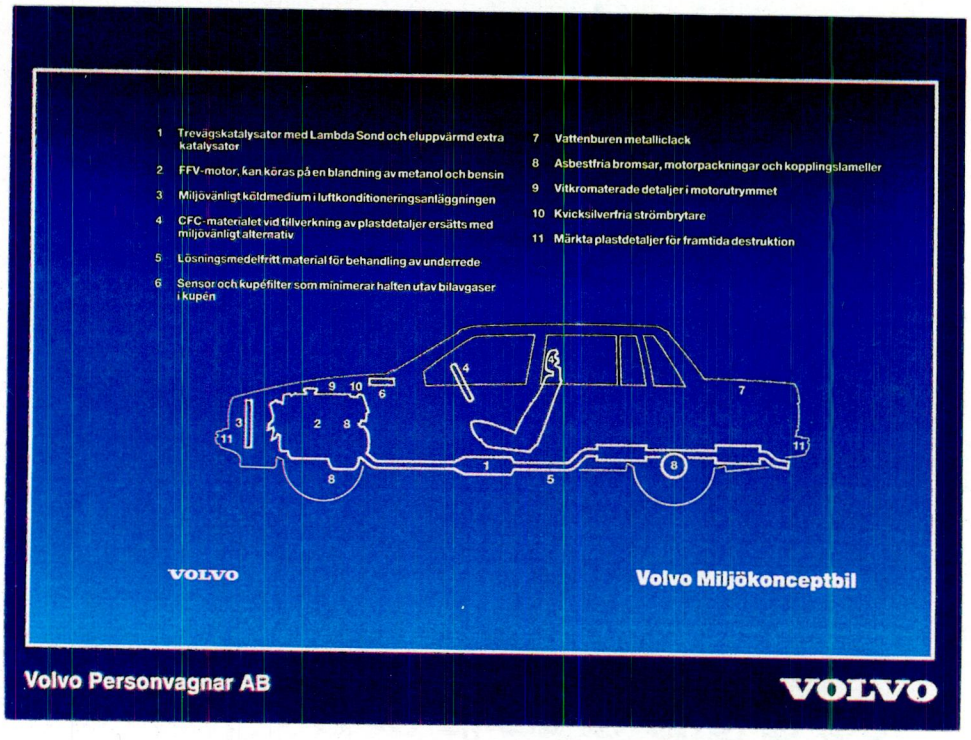
The willingness of consumers in Ireland to regard environmental benefit as a purchasing criterion has resulted in the emergence of new products in markets as diverse as household cleaners and office stationery. This increased awareness has led manufacturers to reassess their environmental credentials and incorporate the 'green' theme into their product ranges. There is increasing scepticism about claims made by manufacturers of their motives to adopt the green approach, some see it as;" little more than a marketing ploy to appeal to the relatively affluent middle class" (Whitney, 1993 p.48)
A report carried out by manufacturers and retailers in Britain in 1988 called The Green Consumer epitomises their approach to environmental concerns. The motivation of this report was to identify and exploit opportunities rather than respond to real consumer needs. The report outlined that to be green was not yet an aspirational term largely because of the alienating financial , anti- progressive image of the main environmental groups. The most common type of environmentally aware consumer was what they termed the " pale green" consumer who had some sympathy with green issues but were suspicious of the ideals of the main environmental groups. Consumers expected either a financial incentive or personal reward for their enlightened choice. However, since this report was conducted in 1988, although it is an indication of the consumers motivation in purchasing choice, the situation has changed. The marketing of the green ideal in product design has moved away from the brown rice and sandals, post-hippy aesthetic to a professional mainstream to at times, slick aesthetic.

The rise of the 'green' consumer has led to change; however , these ideas have not yet filtered down to the built environment. One of the main reasons for this is that property developers are removed from the consumer end of the market. Because of this, they are removed from consumer pressure to improve their environmental position. The initial cost in constructing a building is borne out by the investor whose main concern is to construct a building that satisfies criteria. This shortsightedness of developers in curtailing initial costs by installing ventilation systems that are not energy - efficient heating systems, and are costly to operate, has long- term effects on the owners and users. The developer wants a short- term payback on investment usually within four to five years. In not reviewing the life cycle of the building

over a shorter period of ten to twenty years, the cost incurred by the owners and occupants in fuel bills and reconstruction alone is greatly increased. What is needed is a link between the developer and the end user. The Thermie Programme in effect can provide a bridging gap between the two. Unless there is a system whereby the cost of development and the cost incurred by the user is connected, the market for alternative energy solutions will have difficulty in achieving market acceptance.

One way of doing this is through the environment impact assessment (E.I.A) which is usually conducted at the planning stage of a proposed development; in the past this has been regarded as part of good building practice by developers. Broadly, the assessment considers the direct and indirect effects the development has on people, the landscape and the environment. The assessment is usually carried out by the developer and submitted to the planning authority. However if the users were involved in assessing the real costs in use, before entering into a tenancy agreement, the market for energy efficient methods might improve. One company in Dublin NICER, has already established such a scheme in anticipation of a regulatory requirement.

The design of the Green Building in some ways reflects the path taken by green products designed to gain market acceptance, where it was found that products that in very similar ways perform to conventional products were the most successful. Other products which possessed lower environmental impact but also a reduction in functional performance were hard to accept, especially when combined with a higher price. An example of this can be seen in a concept car produced by Volvo in 1990(fig 14), the car is designed to run on a mixture of methanol and petrol cutting the release of carbon monoxide and hydrocarbon emissions by half that produced by standard car engines. From the outside bodywork the concept car looks deceptively like any other car. However, with the inclusion of technologies that reduce emissions there is a reduction in the engines' performance.



Volvo concept car (fig. 14)

While the EC has provided funds to inform the public on energy efficiency in this project and others, it can also increase the public's awareness of the savings investment that these new building methods and technologies can achieve. The EC 'SAVE' scheme was initiated in 1998 to reduce energy consumption in the home. The boiler efficiency directive, already adopted prohibits the sale of oil and gas boilers below set thresholds of efficiency. Another scheme is electrical appliance labelling, which is expected to have a gradual influence on householder's buying choice. In Ireland the Electricity Supply Board commenced a publicity programme in 1991 highlighting the benefits of the new energy efficient tungsten replacement lamps(fig14); however, these are not yet available on any scale in shops. The problem remains with marketing them as subsets of mainstream products and also making clear how much the consumer stands to gain in the long term.

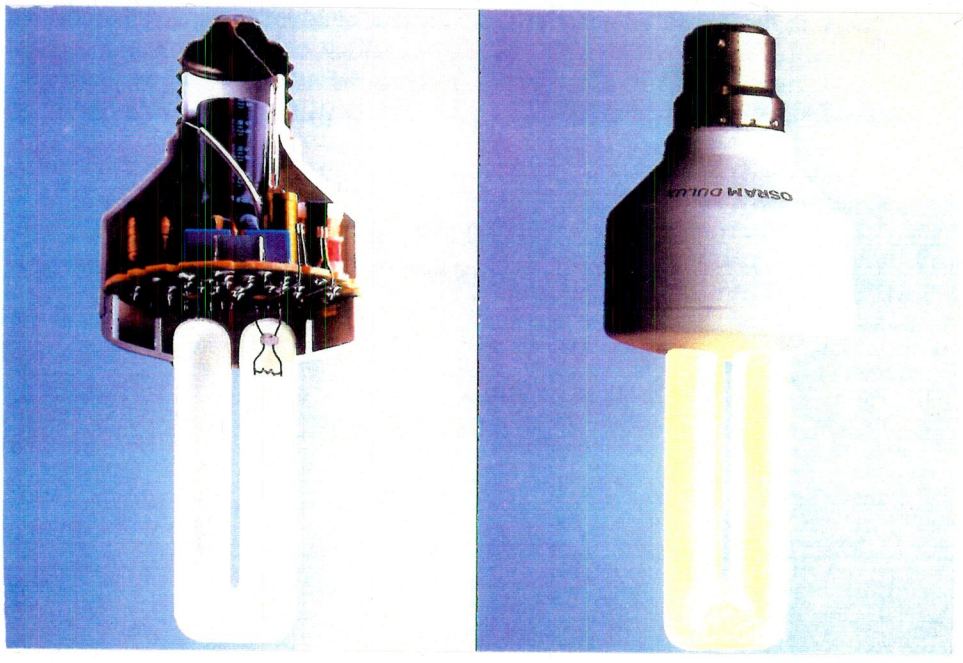
When the Green Building first opened to the public in October 1994, various methods were used to demonstrate the measures taken to reduce global warming. That the carbon dioxide emissions from the building over its lifetime are projected at only 2% of conventional buildings. While this alone was enough to sell the ideas to the public, not enough attention was given to how these technologies that were used in the building would save the user money. Marketing has shown that this is the one area where consumer choice is greatly influenced (Mc Kenzie, 1991, p.62).

The public's perception of energy- efficient products in the past has in some ways prevented the market from growing; one example of a product that achieved highly desirable environmental objectives is the catalytic converter. However they were expensive to install and reduced the energy efficiency of the car, and so did not gain a strong hold on the market. Although consumer choice has been influenced through the marketing of consumer products, trying to sell a greener lifestyle has its problems.

In Germany (considered the leader on environmental issues), the green party 'Der Grüen' in their economic policies have argued for zero economic growth and the inevitable lowering of the material standards of living. It is hardly surprising that their long term economic policies have proven unpopular.

Energy efficiency within the built environment will be influential to consumer choice in the future. The interest shown when Dublins Green Building was under construction is an indication of this. The selling agent Ross Mc Parland received one thousand enquiries in the first eighteen months following the announcement of this project by Temple Bar Properties.

Developers will take on board the green message, what the public wants in the end the market will have to provide.



Tungsten replacement lamp (fig. 14)

Another problem with introducing energy efficient methods can be seen in the building industry. The industry is slow to adopt change, continuing to use well- tried technical solutions as reliable precedents for designers. The amount of research and development carried out by the industry is low, with investments of one percent of annual turnover in research and development(Groak, p174). Most of this however is carried out by component manufacturers. The Green Building is unique in that twenty percent of the £1.5 million allocated to the project was spent on research and development; this would not have been acceptable to a conventional developer. The building industry in Ireland lacks the necessary research resources, consisting as it does of numerous small businesses confronted with financial uncertainty. In reviewing the introduction of new building methods and products it is important to review the introduction of previous building methods and practices. Taige C.G Caitson in his paper Changes within the Building Industry (Caitson, 1991,p195) reveals that the rate of change relative to technology is slow compared to other major industries. He outlines the time taken for new products and systems to take hold within the industry and become standard. One of his examples was the introduction of sheetrock (plasterboard) in America in 1924. Although it was slow to gain acceptance it was a success as it was easy to install, was less labour intensive, but it took forty years from its invention until it was considered standard sheeting material. The reason this material took hold in the industry was because it was in the developer's interest. For energy -efficient technologies to increase their market potential they must consider the needs of the developer. The Green Building encourages this by reducing the amount of materials used. Plasterboard, used extensively in partition walls and suspended ceilings has not been used; instead the walls are exposed. The experimental nature of the Green Building allowed the use of holistic resource management throughout the building's construction; however its use in conventional building projects, apart from the cost involved, would be difficult. The time involved in sourcing materials and products would not be acceptable; because of time constraints; quick decisions are called for in order for the project to meet various deadlines.

Chapter 6

The Green Building is the first of its kind in Ireland in that Government policy has moved towards a more market- driven approach. The aim is to reduce the amount of time and money spent on innovative energy saving technologies gaining market acceptance. Critics of the Green Building see it as a way of improving Ireland's performance within the International Energy Agency. In 1989 Ireland fell to the bottom of the I.E.A. table for research and development in the conservation of energy and renewable energy sources. By initiating a project with the help of E.C. money that demonstrates a building with innovative features will in some way will make amends to this. Until now, Government involvement in relation to environmental issues was one of command and control policies. The carbon tax is an example of one such policy, the British government are at the moment considering imposing green taxes on industry coupled with financial incentives for companies to switch to greener technologies.

The Irish Government's involvement in energy efficiency has largely been influenced by EC energy policy. This has shaped national policy on diversification away from oil and on the rational use of energy. Encouraged by Government policies, the Irish building industry has on average a higher pro-rata output than any other European country since the early Sixties, particularly in the residential sector (Goulding, 1993,p142). The most recent development in government legislation is the introduction of the National Building Regulations in June 1992. The standards outline the functional requirements of ventilation and heating appliances rather than energy performance. With regards to buildings a section is especially concerned with the fuel and energy requirements; buildings are to be "built so as to conserve fuel and energy as far as practicable" (National Building Standards, 1992, part J). This is particularly aided at heat loss through the fabric of the building shall be minimised and heat gains maximised. The new regulations, which apply to all new buildings, were expected to stimulate a number of developments. An example of this is the increased use of insulation material, this necessitating a change in building practice (what the Green Building has been trying to do), however increased insulation could lead the industry to experiment with various types of insulation

material that might be more harmful to the environment but meet the government's guidelines at a reduced cost. The problems with introducing legislation can lead to one direction as shown here, but also to a more positive direction as an example from Germany proves. The German Government introduced legislation imposing higher environmental standards on building products; this created a bottleneck, leading to technological innovation to overcome new standards at no extra cost to the consumer and the developer. The German approach can be seen as a more positive approach incorporating environmental policy with building standards, as opposed to individual standards for both. The problem, however, with legislation is, just as the catalytic converter's introduction has proved, that very often legislation curtails the right to choose, thus making it unpopular to enforce. The approach has been adopted in 1990 in America, legislation was passed to facilitate the integration of innovative technologies into Government-owned buildings. (Pelish, 1991,p 506)

The British government have recently produced a report that places environmental protection at the heart of economic policy. It outlines a scheme whereby instead of national insurance contributions these should be replaced by taxes on the use of energy and natural resources by industry. This is a complete turn about in policy as the EU has dropped its longstanding proposal for the introduction of a carbon tax in all member states after considerable opposition from Britain. It is however only a matter of time before the carbon tax will be introduced. The Irish Government's reaction should be to implement follow on schemes in conjunction with the Green Building to help Irish manufacturers of energy efficient technologies and materials to gain market acceptance both here and abroad. This could be done through the use of these technologies in Government owned buildings, initiating a suppliers charter by the Government stating the environmental expectations of those supplying goods and services to them. Building regulations could be adapted and progressively upgraded to encourage the use of passive solar features. Schemes like the Building Research Environmental Assessment Method (BREEM) in use in Britain should be implemented. This scheme uses trained assessors that provide a broad environmental assessment of a proposed development. The assessment is typically carried out at the detailed design stage and results in the assignment of an energy performance indicator for the building.

It is essential to help energy efficient technologies and materials that have a lower environmental impact gain market acceptance In Ireland; the Green Building is essentially a step in the right direction however a lot more has to be done if they are to remain competitive.

" Who wins the races to perfect and sell green technologies will depend to a great extent who has the edge in engineering and marketing skills" (Gibson, The Big Green Payoff, p.62)

Conclusion

The Green Building, with help from the Thermie Programme has addressed some of the main areas for change within the built environment. It has also highlighted some fundamental requirements if a sustainable architecture is to be realised in the future. These would include an independent guide for architects and designers to source products and materials that have a lower environmental impact, and an increase in the public's, and more importantly, the developers awareness of the financial benefits to be gained by adopting energy efficiency. As a demonstration project, the building has posed the concept that a Green approach to architecture does not mean a radical change in lifestyle, that the inclusion of energy saving technologies are not a means of control but can work with conventional systems to reduce energy consumption. The building has provided valuable information for use in future projects through the use of monitoring equipment to gauge how well the architectural potential of bio-climatic principles and the use of energy efficient technologies perform.

The Green approach to architecture can no longer be left up to the personal taste or moral responsibility of the architects. Increased legislation and consumer pressure to improve environmental performance within the building industry must eventually lead to change. Governments in the past have handled green issues as 'one off' solutions through legislation or schemes like the EEC 'Save' programme. The introduction of legislation is viewed by environmentalists as treating the symptoms of the problem and not addressing the cause. The Thermie Programme differs in that it tries to go to the root of the problem by providing financial assistance to building projects that promote energy efficiency and reduce environmental impact. This project has provided developers and designers in the E.U. and more specifically, Ireland with practical demonstrations of the viability of energy efficient technologies.

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