SCOTT BROWNRIGG
DESIGN RESEARCH UNIT

INTELLIGENT ARCHITECTURE \ ISSUE TWO

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Preface

The RIBA has recently published the paper 'Architectural Research: Three Myths and One Model' asking the question "What is architectural research?" The three myths offered:

Myth One: Architecture is just architecture
Myth Two: Architecture is not architecture
Myth Three: Building a building is research

We would encourage you to seek out this paper and read what are valuable and interesting propositions regarding the stated myths, set against the tenet:

> Research is to be understood as original investigation undertaken in order to gain knowledge and understanding.

It is the last of these myths that we intend to investigate further in this issue of iA, for within the definition offered there are some assumptions which challenge the notion of making, and of object/artefact that are worth exploring.

We are therefore offering as a counterpoint view, that the building or artefact can still bare original discovery post-completion as an artefact in the historical analysis.

First then, the full myth, as put forward by the RIBA:

MYTH THREE:
BUILDING A BUILDING IS RESEARCH

The third myth is that designing a building is a form of research in its own right. It is a myth that allows architects and architectural academics to eschew the norms of research (and also to complain when those norms are used to critique buildings as research proposals). The argument to support this myth goes something like this:

1. *Architectural knowledge ultimately resides in the built object*
2. *Every building is by definition unique and thus original*
3. *The production of buildings can thus be defined as the production of original knowledge*
4. *This is a definition of research*

It is a compelling enough argument to allow generations of architects (as well as designers and artists) to feel confident in saying that the very act of making is sufficient in terms of research, and then to argue that the evidence is in front of all our eyes if we would just choose to look.

However, it is also an argument that leads to denial of the real benefits of research, and so it is worth unpicking.

Architectural knowledge may lie to some extent in the building, but it also lies elsewhere: in the processes that lead to the building, in the representation of the building, in its use, in the theories beyond the building, and so on. Architecture exceeds the building as object, just as art exceeds the painting as object. Architectural research must therefore address this expanded field.

A 'good' building is not necessarily good research, and good research may lead to 'bad' buildings. Architecture is normatively described as 'good' because it fits into known and tested canons of taste, type or tectonics.

But this 'goodness' does not constitute good research, in so much as it is not particularly original or significant. A 'good' building, far from pushing towards new forms of knowledge, merely establishes or incrementally shifts the status. Equally buildings that are normatively described as 'bad' may be the outcomes of good research – for example the technologies and construction procedures of food distribution centres.

If we take Bruce Archer's definition of research (that it is a "systematic inquiry whose goal is communicable knowledge"), then the building as building fails the test. Architects clearly have to be thorough, but they are not necessarily systematic. Choices and decisions are made but not normally through systematic evaluation. More crucially, whilst architects may believe that knowledge is there in the building to be appropriated by critics, users or other architects, they very rarely explicitly communicate the knowledge. It thus lies tacit, thereby failing Archer's second test of communicability.

Designing a building is thus not necessarily research. The building as building reduces architecture to mute objects. These in themselves are not sufficient as the stuff of research inquiry. In order to move things on, to add to the store of knowledge, we need to understand the processes that led to the object and to interrogate the life of the object after its completion.

There are contained in these ideas things that we might all nod in agreement with, others perhaps not so. In our last issue, we mentioned the notion of "Praxis", the combination of theory and practice, which in many ways describes our attitude towards both product and process being so intrinsically linked that the suggested separation above need not apply. Equally, that the artefact or object cannot be worthy of original study – research – is questionable as architectural history would evidently suggest.

The projects highlighted here can be seen as representing both product and process, and as a collective seen as the 'body of evidence'.

So, we offer the subject and contents of iA as research through practice (praxis) and a sense of "genius loci" not necessarily in the Christian Norberg-Schulz[1] phenomenological way, but as a response to place, climate and culture.

We leave you with a further thought on the third myth, as Theo Crosby once said:

> Design should never be prefaced by good or bad, if it is good then it has been designed, if it is bad, it hasn't ●

[1] Christian Norbeg-Schulz – Genius Loci; Towards a Phenomenolgy of Architecture

'Research is to be understood as original investigation undertaken in order to gain knowledge and understanding'

BELOW
Site plan

OPPOSITE FROM TOP
Section showing segregated departure and arrival passenger flows; Arrivals mezzanine; Arrivals level; Departure level

Retrospective: Heathrow Airport Terminal 4

Earlier this year Heathrow Airport announced that its new Terminal 2 will open on 4 June 2014. "Putting the passenger at its heart", John Holland-Kaye, Heathrow Development Director said "The new Terminal has been designed around the needs of our passengers, to allow them to get to and from their flights as quickly as possible". Twenty eight years ago another passenger-centric Terminal opened its doors – Heathrow Terminal 4. Here, Claire Donald looks back at the Scott Brownrigg & Turner design for British Airports Authority.

Built by Taylor Woodrow Construction, the £200m scheme was considered at the time to have been the biggest building project in the country prior to the Channel Tunnel.

Addressing continued growth in the air travel industry, Heathrow Airport, the world's busiest international airport, needed to increase its capacity to 38 million passengers a year through the addition of a fourth terminal. As Mike King, Director of Heathrow Airport stated at the time:

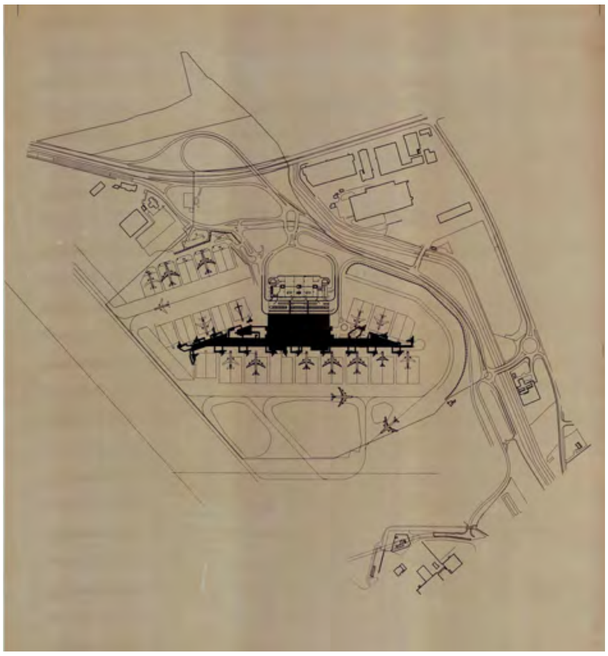
> The British Airports Authority are not only the owners and operators of the airport, but as world leaders in airport planning and design we are providing a terminal for the future with the hallmarks of Space, Speed, Simplicity and Service.

These hallmarks mirrored the design parameters proposed within Scott Brownrigg & Turner's winning design concept.

For the previous 30 years Heathrow Airport had been the hub of world civil aviation; it was felt that a fully integrated four terminal system would guarantee it held this position for the future.

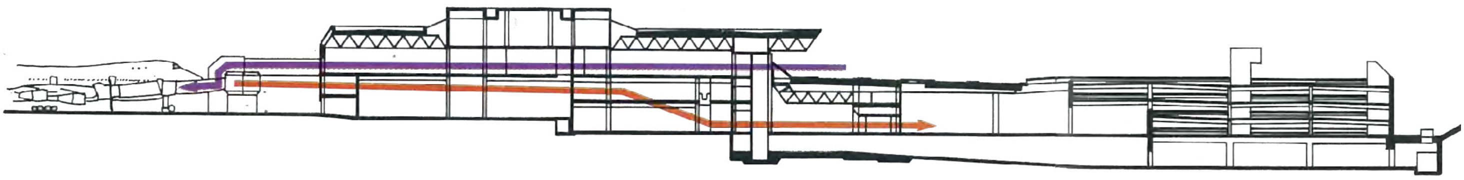
Heathrow's progress was typical and reflective of the development of air transport. The airport opened in 1946 and by 1965 was handling 10 million passengers a year. By 1975 that figure had doubled, and by 1983 it had exceeded 30 million; the addition of Terminal 4 would take this capacity to 38 million per year, with 2,000 passengers per hour passing through its arrival and departure lounges.

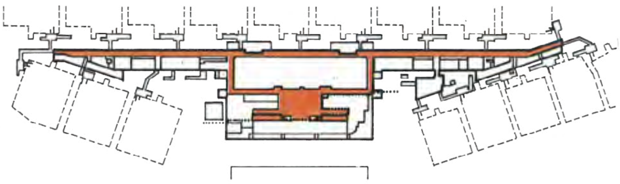
With this desire, planning for the new terminal started in 1973; four years later British Airports Authority (BAA) submitted a planning application to Greater London Council for a site on the airport's Southside; with the go-ahead given in December 1979.

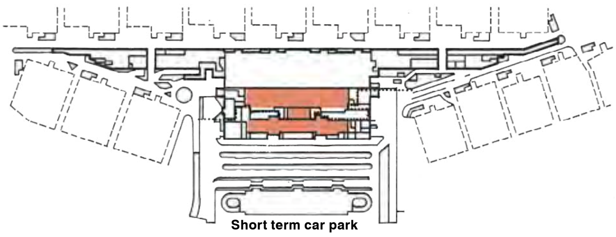


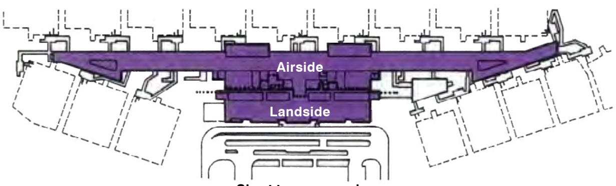
The decision was taken to build Terminal 4 outside of the existing central terminal area, using land on a site originally designated as an aircraft maintenance area.

Constrained by the existing Heathrow operation and the A30, there was also a need to provide a new land side road system and car parking to the south-east, as well as a requirement to maximize the number of integrated aircraft stands. Together these would considerably reduce the area available for the new terminal building. The terminal and its apron had to fit into a 70 ha (173 acre) area bounded by two runways and the airport









perimeter road. Planning issues would also impact significantly on the design of the terminal, with the local authority requirement to limit the building height to just 20 metres. The terminal building itself was 97,000 sq m.

In 1977 the project went to a limited competition amongst five architectural practices; submissions were judged by the board.

The scheme by Scott Brownrigg & Turner was selected on the basis of its interpretation of the planning brief, design quality and cost. Right from the start:

> A set of design parameters was established – expressed as **Space, Speed, Simplicity,** and **Service**. The overriding design concept was to make airport life as pleasant as possible for the passenger.

The design consultancy team was led by four people from Scott Brownrigg & Turner – Chairman, Ken Gilham, and Associates Chris Blow, responsible for the initial concept and brief, Ann Gibson, responsible for the detailed design, and John Church responsible for the day-to-day consultancy and delivery.

Of the design, Ken Gilham stated:

> The byword of the design is flexibility, everything is moveable so the function of different parts of the terminal can be changed to fit in with future demands.

Four key functional aspects would form the basis of the planning and design of the terminal:

1. **The ability to connect the maximum number of terminal-served stands**
2. **The total airside segregation of departing and arriving passengers**
3. **The creation of a flexible airside concourse space to allow maximum freedom of passenger movement and optimum access to commercial and catering facilities**
4. **Maximum economy in operation achieved by the centralisation of controls**

Perhaps the most innovative of these was that despite the severe height restrictions, the terminal was designed to offer complete vertical segregation, with arrivals and departures located on separate floor levels. This, together with a 650 metre-long, 25 metre wide, air side departures concourse, housing all passenger facilities and without gate assembly →

enclosures, would allow for the increased speed of passenger flows, and for trolleys to be taken right to boarding point.

This major innovation provided a number of benefits and represented a move away from the traditional departure lounge, which had, until this point comprised of lengthy, dull corridors and sterile enclosed gaterooms. The concourse design, considered at that the time to be the longest in the world, would encourage passengers to spend more time airside, to take advantage of duty free and tax paid shopping in a relaxed, tree-lined boulevard with café's, bars and shops, visible boarding points and reassuring views of the aircrafts.

It would also allow for a major factor in the development of the scheme to be achieved – that passengers could travel through the building either on the level or in a downward direction; these movements were facilitated by generous ramps, lifts, escalators and 500 metres of moving walkways.

There was also the desired objective to park the maximum number of wide-bodied aircraft directly at the terminal. On its opening, 80% of its stands were terminal served in contrast to 60% for the other terminals.

The apron layout was future proofed to allow for the advent of aircraft with a maximum wingspan of 70 metres, length of 86 metres and a tail height of 21 metres.

The landside departures concourse was designed to accommodate 84 check-in desks placed in a single line to ensure identification of appropriate check-in points, with generous queuing and circulation areas. Landside commercial facilities were deliberately kept to a minimal to encourage passengers to move airside and alleviate congestion.

In 1982, the construction of the Terminal 4 Piccadilly Line underground station commenced. Forming part of London Underground's £23m Piccadilly Line extension, the works would enable airport passengers to take a loop beneath the airport, first to the new Terminal 4, then subsequently to Terminals 1, 2 and 3. A lift system would directly deposit or collect passengers to and from the landside concourse. Short-stay car parking in the form of a multi-storey car park, would be provided at the front of the building.

The work needed to bring the terminal building from a simple concept to full delivery involved 35,000 major design and engineering drawings, with extensive investment in, and use of state-of-the-art computer-aided design techniques and systems by the practice.

As quoted in the Daily Telegraph March 11 1986:

> The scheme comprised £22m investment, a departure concourse one third of a mile long, the biggest baggage carousels in the world and up to 60 people working on the plans at one time, half of them architects.

FROM FAR LEFT
Landside departure concourse; Landside entrance to departure level

‘A set of design parameters were established – expressed as Space, Speed, Simplicity, and Service. The overriding design concept was to make airport life as pleasant as possible for the passenger’

The terminals four year construction programme proved an enormous challenge. BAA appointed a management contractor to manage and co-ordinate construction, this involved 700 individual contracts, ranging in value from a few hundred pounds to many millions and incorporated 49,000 sq m of external cladding and 13,000 tonnes of structural steel works. During construction foreign products were only specified where British ones failed to come up to the mark. The building was designed as a steel frame structure with concrete floors. The permanent steel shuttering provided key-ways at 150mm centre for services and ceiling supports. The main roof areas were concrete with an upside down roof covering construction. The external cladding consisted of an insulated anodised aluminium sandwich based on a repeating module of 1200mm.

The window area and its construction was considered in order to attenuate the external noise from the aircraft adjacent to the building and to maximise day lighting of the public concourses, whilst minimising the effects on the comfort of the occupants.

The windows were virtually continuous at each level, 2.2m high in public concourses.

The architectural design for the concourses always included the concept of exposed services and structure to enhance the volume of the space. The building also included the largest single plantroom in Europe. This roof plantroom, located over the central area of the terminal measured 182m long x 32m wide x 505m height.

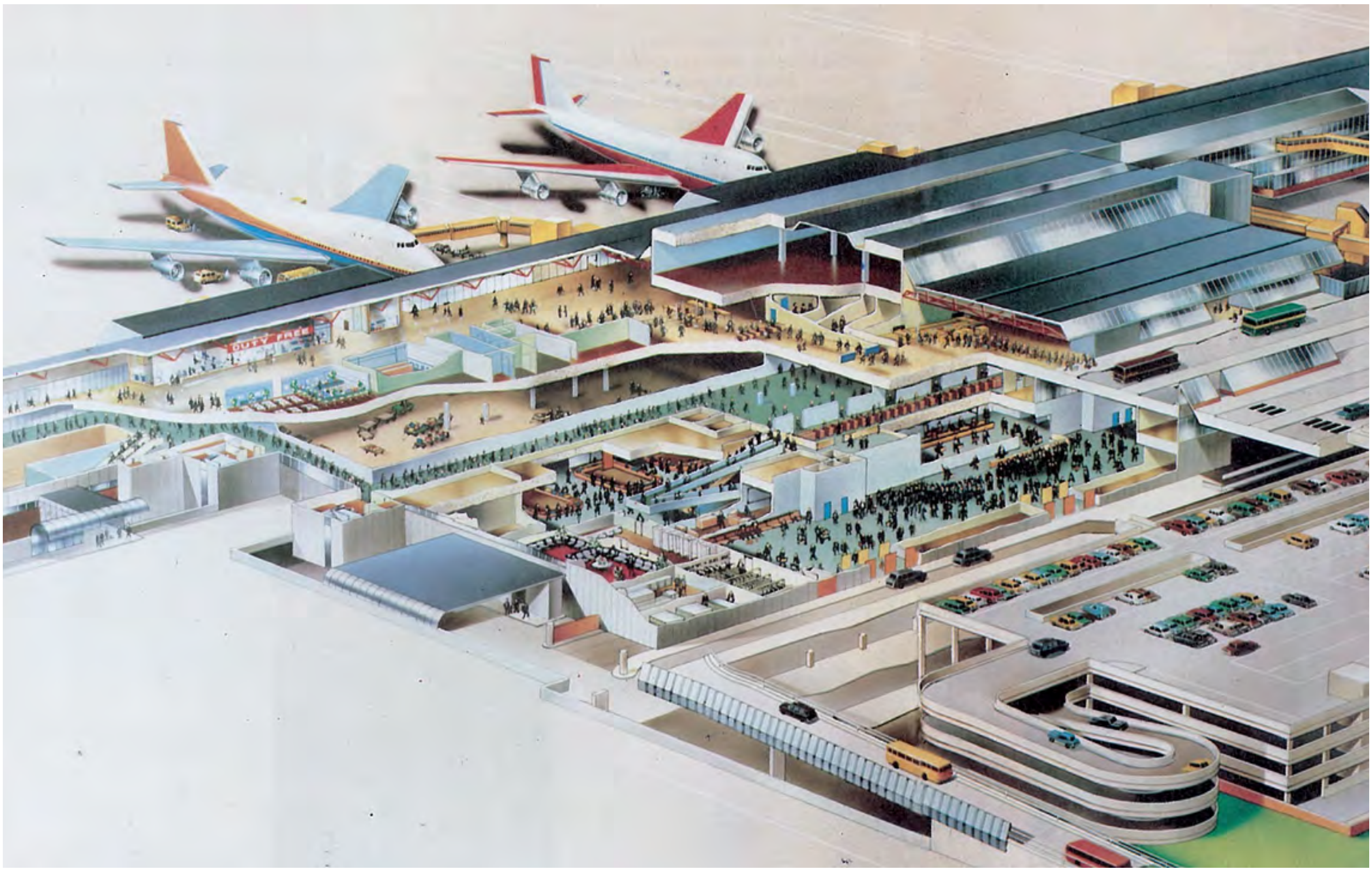
Internal finishes were designed to reflect the external appearance of the building. The 1.2m planning grid imposed a strict discipline and floor, wall and ceiling units were all dimensionally coordinated to ensure the joints between elements line up.

In the public area the external cladding was echoed by aluminium honeycomb, developed from a Ciba-Geigy product used in aircraft floors. As with many of the internal finishes, the panels were custom-made; manufacturers were so keen to be involved with the prestigious project that they created unique one-off designs for inclusion.

The terrazzo flooring in the landside concourse was specially formulated for Terminal 4 to be extra hard wearing and resistant to cracking. Peter Crutch from Fitch & Co. designed the concourse chair system; a modular system based on a cantilever, and deceptively simple in appearance, using steel technology developed for racing cycles. The furniture shapes were also designed to echo the structural form of the building.

As site activity reached its peak in 1983, expenditure levels escalated to over £1million a week, and the workforce increased from 650 to 1,100 to ensure the terminal would be operational in 1985 and brought within the £200 million budget.

The new terminal was always planned as predominantly long-haul to relieve pressure on Terminal 3. Considered as →



the flagship terminal for the airport, British Airways would subsequently go on to operate its long-haul flights including Concorde and its flights to Pairs and Amsterdam out of the Terminal; KLM became the other major airline represented.

Terminal 4 was officially opened on 1 April 1986 by HRH Prince and Princess of Wales. On opening the new terminal, Prince Charles noted it as a:

> Substantially British achievement, and as such it represents a national success story.

800 guests joined the royal couple at lunch in the departure lounge, with a Boeing 747 and Concorde parked close by.

The terminal was ranked the best UK airport by readers of Condé Nast Traveller, coming out top in Europe and fourth favourite in the world. Yet it was criticised by some for its:

> Space-age, stark aluminium external cladding and its vast open internal spaces.

Including criticism from Richard Rogers on the exposed ducts and ‘frankly’ expressed steel structure, which at the time was compared to his very own exposed ducts and ‘frankly’ expressed steel structure design of the Inmos microchip factory in Gwent.

Some commented that they had been disappointed that such a vast building was not more memorable or more architecturally flamboyant, however as Anthony Williams of Anthony Williams and Partners commented in Building Dossier:

> Certainly its plan is memorable for its pure simplicity, and I think the architects are to be congratulated for maintaining this simplicity and avoiding the temptation to be too sophisticated.

He continues:

> The success of the design depends on the linear concept, and the acceptance of the huge scale and subsequent handling of large spaces. The interior design by Fitch, is reassuring, considerate and caring. Behind the apparent simplicity there are enormously complicated planning and servicing problems that have been resolved in such a manner so that one is not even conscious that they existed.

The Times May 25 1984 commented that:

> The new terminal advances thinking on airports planning around the world.

At the time Scott Brownrigg & Turner had 200 staff (70 qualified architects) and was considered one of the largest practices in the UK, the practice was also working on its biggest project, the £400m Baghdad International Airport.

Terminal 4 was a massive design management exercise, which succeeded in devising and maintaining an extremely simple linear planning concept on a vast scale, making the passenger’s journey through the terminal both relaxed and enjoyable.

CLOCKWISE FROM ABOVE

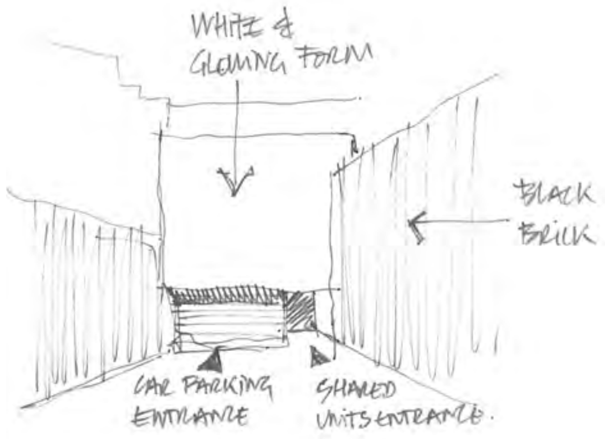
Exploded view of terminal; Terminal aircraft stands; Baggage reclaim

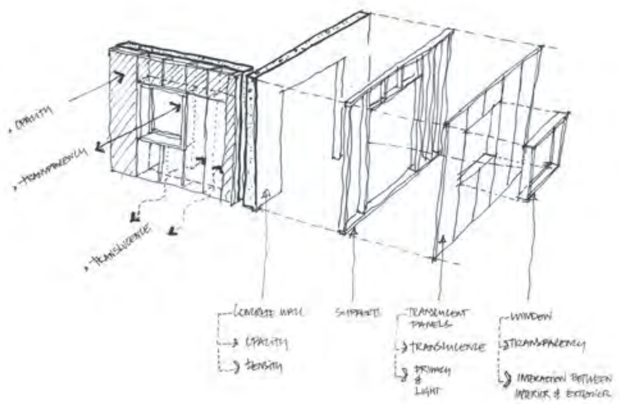
‘Certainly its plan is memorable for its pure simplicity, and I think the architects are to be congratulated for maintaining this simplicity and avoiding the temptation to be too sophisticated’

Building Design’s Nigel Newton in 1985 commented:

> Terminal 4 has been designed with travellers in mind; their enjoyment; their comfort and their spending power.

In the next issue of iA we will review the state-of-the-art CAD system which allowed for the successful delivery of the scheme ●





Case Study: Down Street Mews, Picadilly

Located in a constricted urban context, the Down Street Mews residential scheme explores the parameters of light, privacy and form. Here, Stephane Lambert-James examines how the project was inspired by the iconic La Maison de Verre and Japanese architectural screen features (the shoji and the fusuma).

The brief was to demolish the former annex building to the Cavalry and Guards Club located within a quiet mews adjacent to Green Park, and to erect a new four storey building with three basement levels for use as two luxury single family dwellings.

The site context was particularly challenging for a residential project: the end of a mews with restricted access and a lack of character, surrounded by tall buildings (including the Grade II* listed Cavalry and Guards Club) and with four party wall agreements in place. In short, it was like designing a residential building within a deep shoe box, with only one side half opened and with limited access to daylight.

Despite the challenges, the project presented an opportunity to enhance the current mews and to design two high end contemporary residential units in the middle of the Mayfair Conservation Area.

Only one form proved to be suitable to the constraints of the site and the nature of the brief; one which is the simplest and most common of shapes used in residential architecture and which is easy to identify in complex and dense surroundings: 'the cube'. By designing two clearly defined cubes, two courtyards were created allowing each dwelling to have three elevations exposed to the three key orientations: the East, the South and the West, thus capturing the most natural daylight possible.

CLOCKWISE FROM ABOVE

Concept sketches; Down Street Mews CGI; CGI view from street; Maison de Verre; Concept sketch

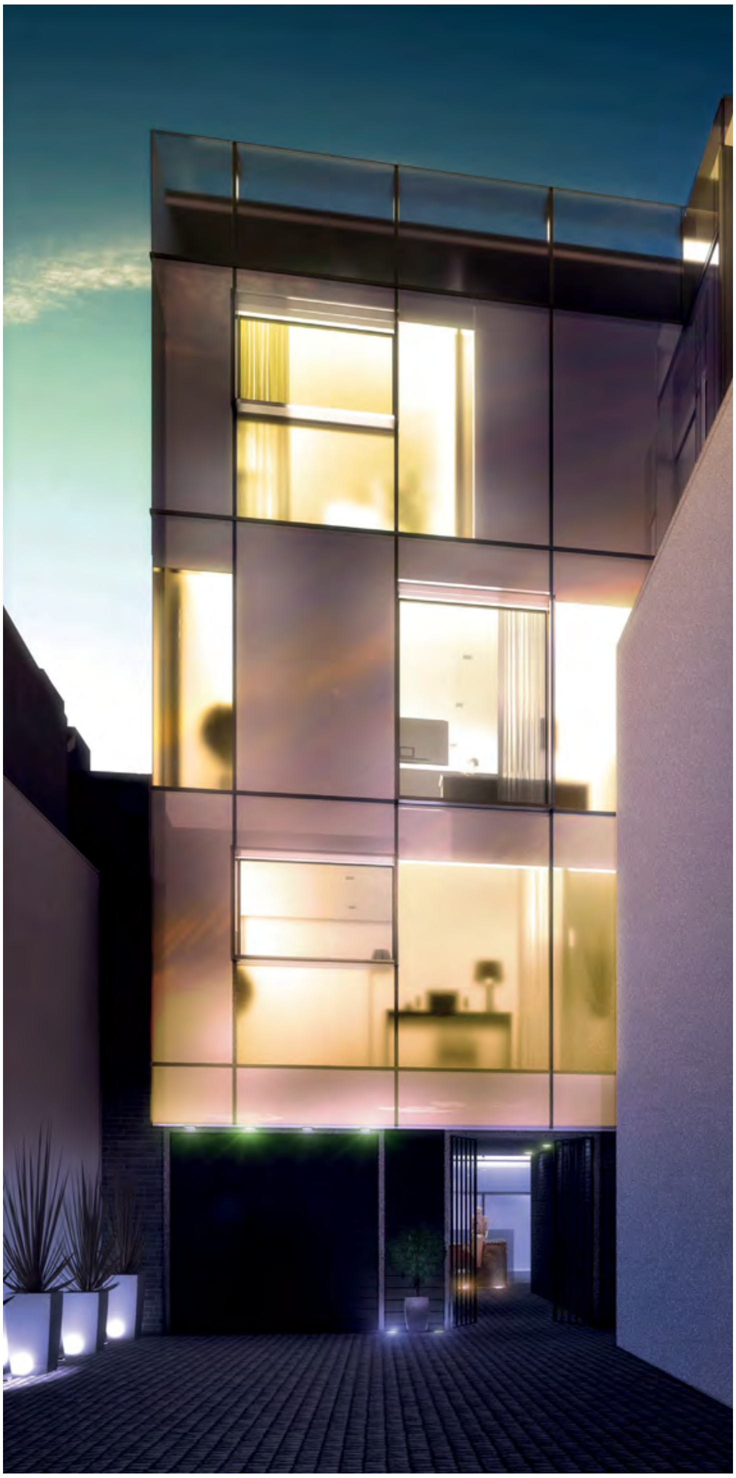
La Maison de Verre (translated as 'House of Glass'), a hidden but well known gem in the 7th arrondissement of Paris, was the catalyst to the concept of two glass boxes. Built in 1932 behind the solemn carriage entrance of a traditional French residence, La Maison de Verre is not only a milestone of modern architecture, but also the splendid result of collaboration between three disciplines: a furniture and interiors designer, Pierre Chareau; a Dutch architect, Bernard Bijovet; and a metal worker, Luis Dalbet, making the architectural language of this internally sophisticated light catcher consistent and coherent from the scale of the façade to the scale of the furniture.

These characteristics of La Masion de Verre provided a great source of inspiration for our project in terms of its translucent and glowing form, the special internal division and the honesty of the materials.

Like La Maison de Verre, the two proposed houses use skeleton frame steel construction allowing a free plan and therefore a flexible interior layout, which can potentially be divided by permanent or movable screens in each of the upper floors.

The Down Street Mews units were also designed with generous ceiling heights to not only allow natural daylight to flow inside the rooms but also to give the building the potential to be adaptable for other uses in the future.

Whilst the two dwellings were designed as glass boxes to let the light flow inside the rooms, the intention was also to explore a way of regulating the degree of intimacy and light in each room, playing an occasional game of shadows.

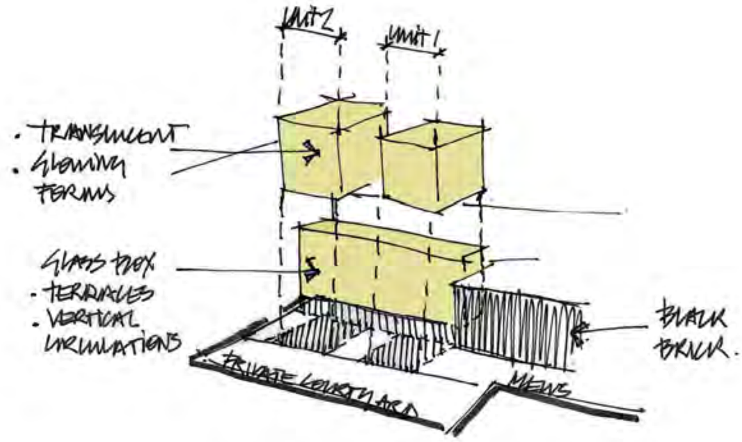


The composition of the façade is an interpretation of Japanese sliding screens made of either white translucent paper, which provides light, warmth and intimacy (the shoji), or opaque paper for privacy and interaction between the outside and the inside (the fusuma).

Made of one layer of frosted glass applied on both sides of a steel frame, the façade has its outer skin running consistently on all façades, whilst its inner skin changes to produce the opaque or the translucent finish required. Only the windows interrupt the outer skin leaving the space fully connected to the outside.

In order to keep the flow and feeling of space and continuous design, the interior design has been developed around the same concepts, using a refined palette to work harmoniously with the exterior. The aim is to create a monolithic shell that will facilitate the future resident in putting their own stamp on the building. It is however, not a blank canvas; it is one canvas that has many layers, albeit all white, that creates a home which celebrates the light and openness achieved in a small space.

The project is due to start on site in May 2014 ●



4

Pure Research: In-between Spaces

Here, Interior Design Director, Ken Giannini explains his workplace philosophy for the In-between Spaces.

“Workplace design today is no longer about your desk. The desk is dead.”

I believe that the design of the workplace today should be focused on what I call the ‘in-between spaces’, places away from the desk where collaboration, chance encounters and concentrated work takes place. The break out zones, touchdown spaces, meet and greet spaces, café’s, business lounges, presentation spaces, project spaces, meeting rooms, quiet rooms, hubs, VC pods, quiet booths, telepresence spaces, coffee bars, project team spaces and restaurants are the real areas where the most inspirational work takes place. Equally important though is that these spaces, when created and executed well, can change or encourage new behaviours and be the glue that binds organisations and individuals together and setting the tone of an organisation’s culture and brand, providing the catalyst for making a difference to staff performance, loyalty and satisfaction.

Okay, that’s a big assertion and may not apply to every organisation, but the impact of these areas should not be underestimated. If we take a step back I would argue that:

The in-between spaces actually exist in three scales:

Urban Scale
Building Scale
Workplace Scale

URBAN SCALE

This is not a new concept in the urban scale. Ray Oldenberg for example is an American urban sociologist who has written and lectured extensively for decades about the importance of informal urban public places for the good of a community’s social vitality, democracy and civic engagement. He described places such as hairdressers, café’s, bars, pubs, community centres, sports grounds etc. as ‘Third Places’.

I would call these ‘Urban In-Between spaces’. He suggests each have characteristics that promote social equality by levelling the status of guests and encouraging engagement. In his books, ‘Celebrating The Third Place’, 1989 and ‘The Great Good Place’, 1991 he points out the following characteristics of such Urban in-between spaces:

Free or inexpensive
Food and drink, while not essential are important
Highly accessible
Involves regulars – those who habitually congregate there
Welcoming and comfortable
Both new friends and old should be found there

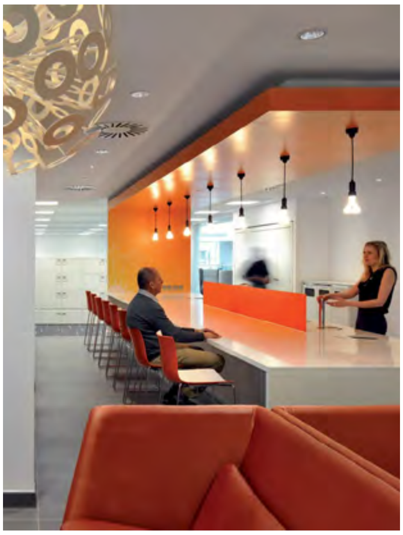
It is remarkable how these characteristics are so similar to the briefs for most interior workplace in-between spaces which I will come on to.

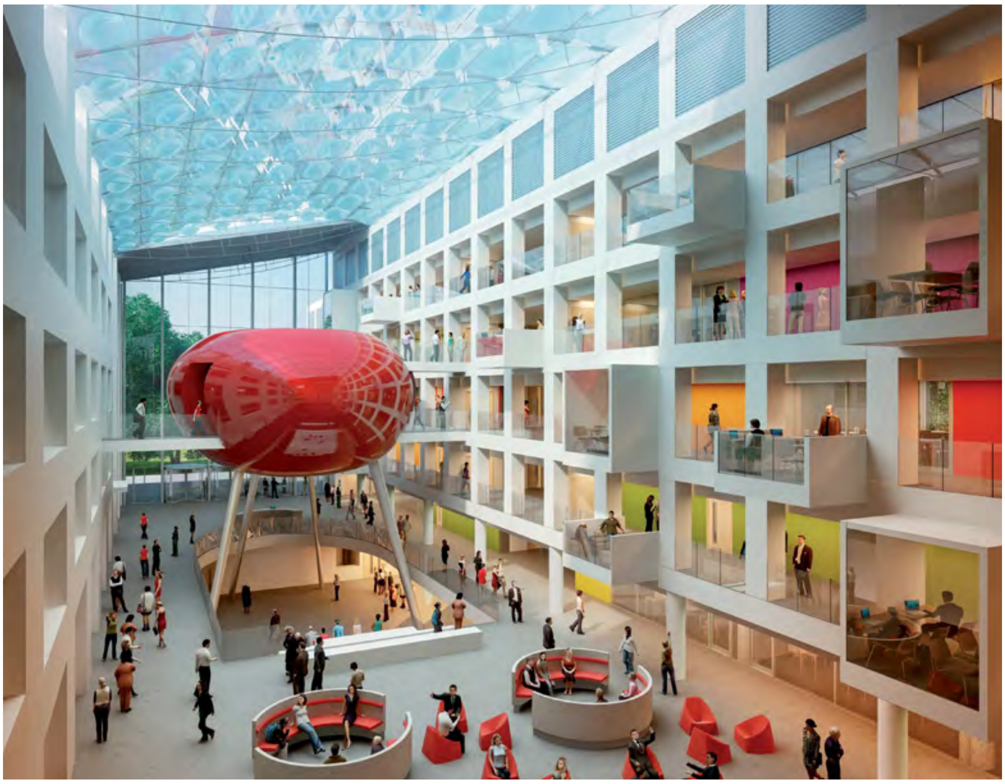
BUILDING SCALE

I am referring to office building design now, and for me the in-between spaces concept means not being afraid of creating spaces architecturally that are unexpected, quirky, irregular and even inefficient. These types of spaces offer great opportunities to create in-between spaces for the occupier. Of course this philosophy doesn’t necessarily conform with the British Council for Offices (BCO) guidelines, as most architects, workplace consultants, developers and agents desire to make speculative buildings super-efficient – 18m deep, 1.5m grid, 2.7m floor to ceiling height and rectangular. What is good for the developer is not always good for the occupier. Many occupiers today see the building as a shell that can evolve and be adapted over time, and unusual spaces are not necessarily a problem, but are an opportunity to create special in-between spaces. Thankfully not all buildings follow the BCO Guidelines to the letter and some of the best office buildings for occupiers have a great deal of in-between spaces. In the UK, these include, the Macquarie Bank building, Unilever HQ, One New Change, BA Waterside, The Co-operative HQ, and even the Suisse Re HQ in the Gherkin, for example. →

CLOCKWISE FROM LEFT

Google, Victoria; Southampton Solent University; British Gas, Oxford





FROM ABOVE

Global Management Consultant, London; Arthur J Gallagher, London

WORKPLACE SCALE

Today's focus on in between spaces in the workplace is a result of the changing nature of work and the changing demographics and work styles of today's workforce, which on the one hand getting younger and on the other hand is getting older. Designers and architects are responding to the demands of Generation Y and their tech savvy "work anywhere and anytime" spirit, as well as to the fact that by 2020 over 50% of the working population in the Western world will be over 50 years old. The way these two sets of workers carry out their work is very different, and the types of spaces, furniture, technology and the workplace environments should respond to these differences.

In my view the key to successful in-between spaces are that they should have some or all of the following characteristics:

- **Enable informal or formal meetings/collaborative work in comfort**
- **Enable individual concentrated work with some acoustic and visual privacy**
- **Have available, and free of charge high quality coffee / tea and snacks as part of the experience**
- **Be free to use and available for all**
- **Be available at all times and actively encouraged as alternative work settings to the desk**
- **Be located in the very good parts of the building, with easy access, good natural light or views**
- **Incorporate high quality furniture and finishes**
- **Be flexible to change over time**
- **Be Wi-Fi enabled**

The percentage of budget most organisations' allocate to in-between spaces, compared to workspace, is growing. Our time as designers spent understanding the brief, designing and creating these areas should also grow in proportion to the time committed to understanding and designing general workspaces or desk areas.

For over 30 years workplace consultants and designers have developed sophisticated tools for measuring what happens at the desk, these are often called Time Utilisation Studies or TUS. These tools miss the point completely, as they focus on whether a person is at his/her desk or not, and if they are, what they are doing. I say, who cares what they are doing at their desk. The fact is most people only spend about 40% of their time at their desk during a typical working day or week, regardless of what type of industry or business they work within. For the rest of the time they are either in or out of the office, probably working within in-between spaces.

I believe that the challenge in the world of workplace design is to allocate enough of our time as designers to understanding and creating the appropriate in-between spaces and also to exploring new ideas, and quite frankly, to designing something! It is all too easy to rely on furniture solutions alone, and our role be to simply specify and space plan. That's not good enough.

Not to take anything away from the furniture industry that has marched ahead for several years creating excellent new products specific to the in-between spaces market; however, as designers and architects we should be just as in tune with our client's needs, and design spaces, places and objects that inspire and solve these in-between spaces needs ●

5

Post Occupancy Evaluation: Red Kite House

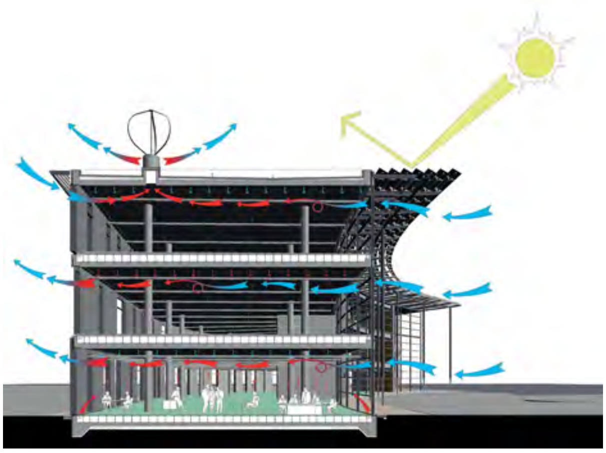
In April 2005 Red Kite House, the headquarters building for the Environment Agency, at Howbery Park, Wallingford completed. At the time, the scheme was at the forefront of sustainable design, eight years on it continues to set the benchmark for best practice. Here, Darren Comber presents the scheme and the findings of the initial post occupancy evaluation carried out by Hoare Lea.

For a twelve month period between its completion in April 2005 and May 2006, the environmental performance of the building was monitored, and a preliminary Post Occupancy Evaluation carried out by Hoare Lea. In the intervening years, Hoare Lea has actively continued to work with the Environment Agency to monitor the performance of the building and give feedback on how its systems can be optimised.

Red Kite House is a 2,787 sq m (30,000 sq ft) office for the Environment Agency, owned by HR Wallingford Ltd. The aim was to construct an office that would meet the Environment Agency's operational needs and serve as an example of best practice in sustainable office development. The building demonstrates leadership in the design of improved working environments.

Red Kite House was designed to achieve a BREEAM 'Excellent' rating, with carbon emissions 26% below that defined in the Department of the Environment's 'Energy Efficiency in Offices' guidance figures. The design was specifically determined to allow for environmental factors, with each element within the design performing a function to either passively cool the building or reduce energy consumption. Its layout harnesses the setting by minimising the solar gain to the building; with orientation and configuration of the plan benefitting from the prevailing winds, allowing the required natural ventilation to have maximum impact within the design.

The structure is a concrete frame and to assist the passive night-time cooling, the windows within the façade were designed to open at night and allow cool air into the building to reduce the temperature of the exposed soffits. The soffits release the cool air over the course of the occupied day to reduce the internal temperature. Manually operated windows enable the occupants to control natural cross-ventilation.



The building is curved in plan and has been orientated east west to provide the ability to capture the prevailing wind and incorporate south facing brise soleil to provide external shading. The orientation of the building allows it to present two façades; the southern facing has more thermal control through the materials with smaller windows to control the sunlight, whereas the north facing façade is more open to daylight with larger areas of glazing. The main glazed façade is orientated towards the internal environment of the site thereby addressing the problem of light pollution. These elements combine to promote the ability to achieve the required internal natural daylight levels and environmental conditions whilst complying with the requirements for Part L of the building regulations.

Heating is achieved through high efficiency condensing boilers aided by weather compensated heating and local thermostatic control. Low energy artificial lighting is achieved through the use of high efficiency T5 lamps, digital ballasts and passive infrared occupancy and daylight sensing lighting control.

ENVIRONMENTAL FEATURES OF THE BUILDINGS' DESIGN

Several best practice environmental features were included within the project.

PHOTO-VOLTAIC CELLS TO GENERATE ELECTRICAL POWER

The cells clad the south-facing brise-soleil which projects about 3m from the roof over the front of the building and provides shade to the interior. These generate approximately 20% of the demand of the building for electrical power and reduce the amount of carbon dioxide being discharged to the atmosphere by 12 tonnes per annum.

SOLAR PANELS TO PROVIDE HOT WATER

Installed on the roof, the panels satisfy about 40% of the demand for hot water.

RAINWATER HARVESTING SYSTEM TO COLLECT AND RE-USE RAINWATER

The system collects rainwater from the roof for re-use within the building for toilet flushing. This satisfies about 40% of the total demand for water.

MOTORISED CLERESTORY WINDOWS TO ALLOW AN INFLOW OF COOL AIR AT NIGHT

The building has been designed so that the solid ceiling beams act as a heat sink during the day and need to be cooled at night. 100 automatic clerestory windows on each floor can be opened via a motorised system to facilitate this.

SUSTAINABLE UNDERGROUND DRAINAGE SYSTEM (SUDS)

The car park serving the office allows rainwater to soak into the ground, whilst other non-permeable areas drain to a reed bed. This feature was in line with the Environment Agency's active promotion of more sustainable forms of drainage from all developments in order to reduce the impact of run-off on river systems.

The Environment Agency obtained a grant from the DTI to help towards the cost of the PV cells and solar panels.

INITIAL POST OCCUPANCY EVALUATION FINDINGS

The initial results obtained over the 12 month period showed the building to be performing very well; during this time gas consumption was exceptionally low. Comparisons were made with the energy benchmarks in Energy Consumption Guide for Offices. →

LEFT
External view of Red Kite House; Natural ventilation strategy

OVERLEAF
External night view of Red Kite House

FIGURE 1: COMPARISON OF RED KITE HOUSE ENERGY CONSUMPTION WITH GOOD PRACTICE NATURALLY VENTILATION AND AIR CONDITIONED OFFICE BENCHMARKS. DATA TAKEN FROM 12-MONTH PERIOD: APRIL 2005 TO MARCH 2006

■ = ELECTRICITY ■ = GAS

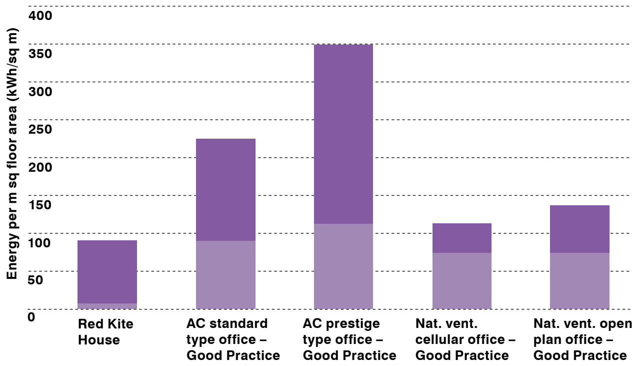


FIGURE 2: COMPARISON OF RED KITE HOUSE CARBON DIOXIDE EMISSIONS WITH GOOD PRACTICE NATURALLY VENTILATED OFFICE AND AIR CONDITIONED OFFICE BENCHMARKS. DATA TAKEN FROM 12–MONTH PERIOD: APRIL 2005 TO MARCH 2006

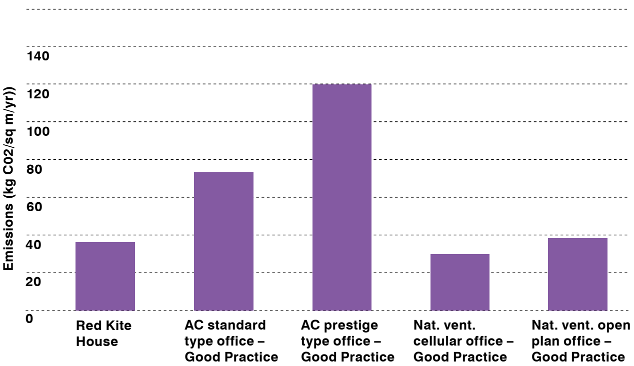
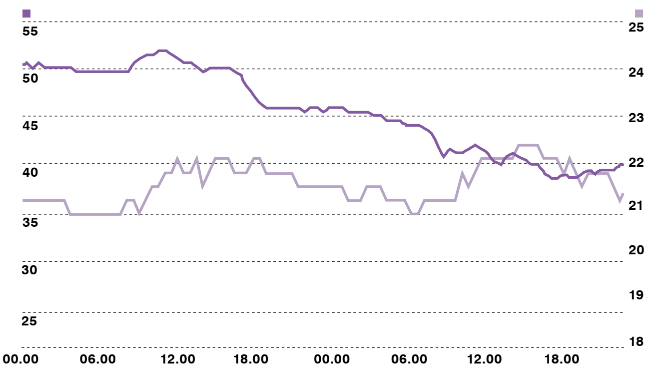


FIGURE 3: SAMPLE OF TEMPERATURE AND HUMIDITY FOR RED KITE HOUSE ON 28 MARCH 2006. DATA SHOWED THE INTERNAL TEMPERATURE RANGE TO BE BETWEEN 21C – 22.5C, WITH RELATIVE HUMIDITY RANGING BETWEEN 38% AND 52%

■ = HUMIDITY ■ = TEMPERATURE



'The structure is a concrete frame and to assist the passive night-time cooling, the windows within the façade were designed to open at night and allow cool air into the building to reduce the temperature of the exposed soffits'

Red Kite House is predominantly a naturally ventilated open plan building. The building compared well against the carbon emissions of a 'good practice' naturally ventilated open plan building. Mechanical ventilation has however been provided in meeting rooms and comfort cooling in the boardroom. A comparison was also made against a good practice air conditioned building. During that period Red Kite House had approximately half of the carbon emissions of a good practice air conditioned building. Experience of the summertime occupation in 2005 was that the building, which has exposed concrete ceilings and night cooling, performed relatively well in comfort terms. This was monitored more closely in 2006 with internal temperatures monitored in six locations within the building.

The environmental monitoring also involved the collection of comfort performance data. Figure 3 shows the internal temperature (light purple line) and relative humidity (dark purple line) of an open plan area of the building. This shows that the natural ventilation system was satisfactory in maintaining the office space within acceptable comforts limits.

Red Kite House set the standard for Scott Brownrigg's on-going sustainable design work, and in June 2011 the building appeared on the front cover of the Government's 'Low Carbon Construction Action Plan'.

It has won and been shortlisted for a raft of sustainability and industry recognised awards including the National Efficiency Awards 2006, the Civic Trust Sustainability Award 2007, the RICS South East Regional Sustainability Award 2006, the IAS/OAS Best Bespoke Development Outside of Central London 2005.

Design Research Unit is currently working with Hoare Lea on a piece of research that compares and contrasts the predominantly naturally ventilated Red Kite House with its sister building Kestrel House, a mechanically ventilated building. The findings will be published in a future edition of iA ●

Building Study: Design in Aggressive Environments

Scott Brownrigg is developing business expansion strategies which will take the practice to key, select parts of the globe. Whilst these will enhance our international reputation and profile and strengthen the design excellence of our UK base, each location has its own distinct climatic challenges which require unique architectural strategies and environmental responses.

Here, we look at three projects in Russia, Bahrain and Malaysia that outline such strategies and offer design solutions that are not only responsive to the aggressive climates in the three locations, but acknowledge the context, cultural, social and historical precedent for designing in these places. These are not wholly reliant on contemporary environmental techniques, but are a more sophisticated synthesis of the two.

MOSCOW

The first, is a significant and substantial business park project in Moscow, Skolkovo Park for Millhouse.

Darren Comber, Scott Brownrigg CEO has led both the project and the company's venture into Russia. He states:

> When Scott Brownrigg first presented in Russia, our portfolio of buildings primarily addressed the desire to minimise solar gain and embrace methods to avoid the heat build-up of buildings by utilising brise soleil and using enhanced coatings to the glazing. The temperature swings that the practice was used to addressing were also very different, and there was an emphasis on cooling buildings rather than heating them.
>
> Our design attitude, primarily in considering passive techniques, was an influencing factor in the client's selection of us in the competition to design the office scheme.
>
> However, the thermal parameters and driving design criteria are considerably different and require building performance that cannot be reliant on passive strategies alone.

THE DESIGN CRITERIA FOR RUSSIA

EXTERNAL DESIGN CRITERIA

(Temperature range across a typical year 58°C)

The external design criteria is in accordance with SNiP 23-01-99* Building Climatology:

PERFORMANCE CRITERIA

Winter -28.0°C @ 84% RH

Summer +26.3°C db, 19°C wb

For central plant, a design summer condition of 30°C db, 23°C wb is used to provide a safety margin.

The thermal performance (U-values) of external building enclosures shall be adopted in accordance with SNiP 23-02-2003:

PERFORMANCE CRITERIA

Walls 0.373 W/ m² K

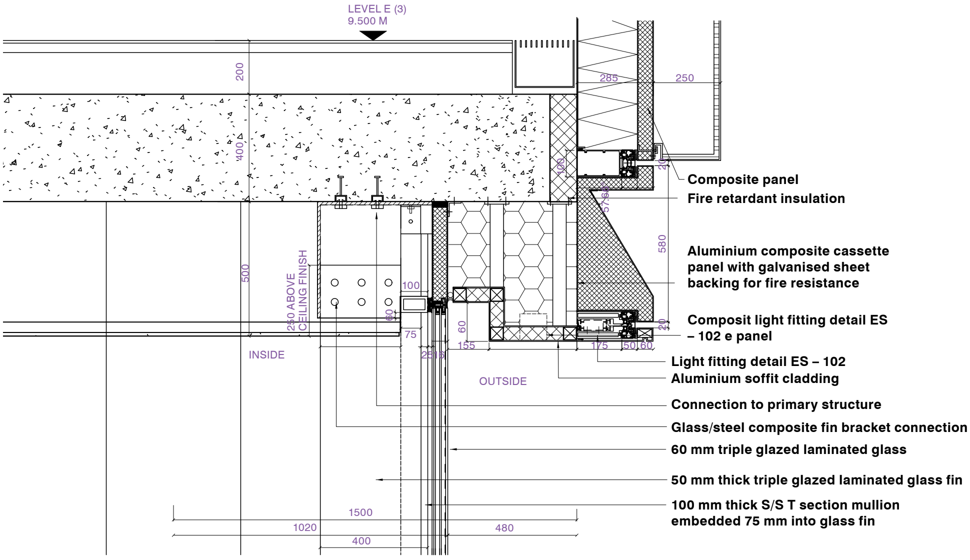
Summer 0.28 W/ m² K

Glazing 1.79 W/m² K

The U-values are verified in the energy efficient design. Glazing shading factor (g-value) is currently assumed as 0.4. A triple glazed façade is required for this thermal performance.

Darren describes the response to fabric first:

> Designing buildings in Russia presents a series of different challenges, primarily because the temperature differentiation across the year ranges between -30°C to +30°C. The usual requirement for solar shading and the desire to minimise solar gain is also not the same and there is an enhanced desire to improve the light quality within the buildings. This is primarily because the daylight in Russia is often a very flat light, it is therefore important to be able to provide as much internal natural daylight as is practical to internal spaces.



FROM TOP

Aerial CGI of Skolkovo Park, Moscow; Insulation detail

It is normal to provide triple glazing and the design criteria to be adhered to preclude certain approaches we would normally explore when designing buildings. However, in turn this has allowed the opportunity to utilise other methods, such as below ground ice storage, so it is very much a case of designing to suit a location and embracing the natural characteristics of environment to find a solution.

Other considerations which have clearly influenced the design approach, include orientation, massing and placement, as well as the everyday social and functional requirements of such huge fluctuations in temperature. The underground and continuous car park (allowing sheltered and tempered access to each of the office buildings) facilitates ease of movement in both winter and summer, there is an active plinth which does likewise, but also takes advantage of the new public realm and landscape; Muscovites want to enjoy the summer months and value the landscape.

The design of the roof was carefully modelled to take into account snow (and snow loading) and this has been developed through the detail design process.

‘Our design attitude, primarily in considering passive techniques, was an influencing factor in the client’s selection of us in the competition to design the office scheme’

To reduce the amount of carbon as well as the running costs of power consumed by the CHW Plant, the project utilises thermal ice storage within the basement levels to offset peak cooling loads in the summer months. →

BAHRAIN

The second project is in the Kingdom of Bahrain and is a scheme for a Medical City, totalling some 5 million sq ft.

Whilst this commission was only for a masterplan and concept design, the intended response to place and environment had to be a significant influence on the way in which the proposed architecture and organisation evolved.

The design criteria for Bahrain has to deal with the extreme heat, and due to its long coast line, the associated humidity at the end of the summer months (July and August). Average temperatures in January are 17°C and in summer are 34°C, however the desert can cool rapidly in most months and a building fabric response that took this variance into account was seen as an opportunity for free night-time cooling for the appropriate six months of this climatic occurrence.

The historic precedent for shade in its most simplest form can be seen within the Bedouin tent; a roof covering with completely openable sides. It is worthy of note that in direct sunlight, the normal response to the extreme heat actually becomes counter-intuitive. We would naturally remove clothing (other than a hat for shade) but here you add layers, for the body of 37°C is cooler than the external one which can reach 52°C, therefore you want to keep the "coolth" in.

Our first design move therefore was to join all the disparate elements together under a single roof, a free form abstract of the Bedouin tent. The roof of this was conceived to offer several passive environmental design strategies, the first was to act as shade or shield. The monumental roof in concrete is covered in ceramic tiles. Here the long tradition of Arabic tile making is combined with contemporary technology. The local craft skills of making these was seen as a natural precedent for the ceramic tiles used as the heat shield on the space shuttle, so the roof reflects the intense heat of the desert sun. The second, uses a composite of cold air filled ETFE and photovoltaics. This generates energy and at the same time filters light into the depth of the plan. Within these parts of the roof are air scoops, reverse funnels which allow for the free night-time cooling in winter months.

The third is the actual form of the roof itself. The sinuous shape, together with the plastic form of the plan elements are conceived to drive cooler sea air into the depth of the plan and generate cross ventilation, pushing out the hotter air from the desert side.

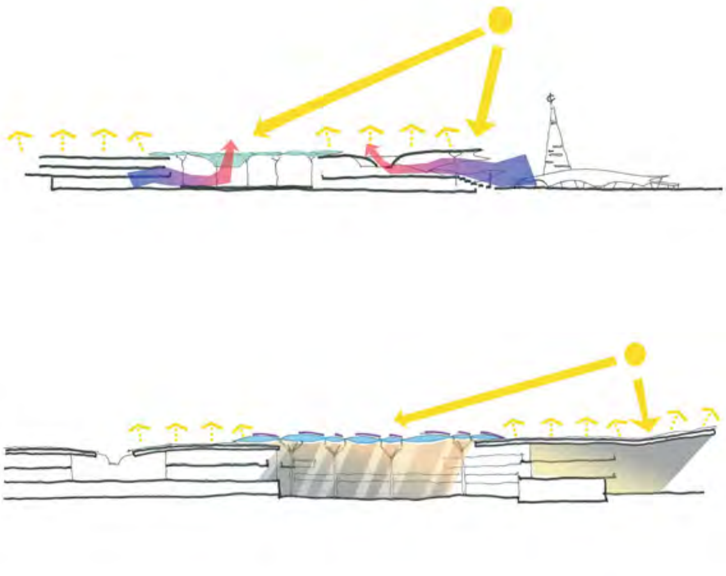
The façades are heavily spatially layered. Deep civic arcades provide solar shading, where together with brise soleil and contemporary interpretations of traditional fretwork, moderate the climate from outside to in.

Within the public spaces, the traditional use of water and fountains is also used to temper the environment, both inside and out. Date and fig palm orchards are used for natural external shade and enhance the sense of well-being within the campus.

Despite all of the above, as in Moscow, orientation and fabric with passive environmental techniques cannot deal with the heat when it is at its most aggressive, or with the sand storms which gather in the desert and migrate seaward. Therefore the proposal is still required to become a hermetically sealed box at particular extremes.

To mitigate therefore as much as possible the reliance on energy for mechanical environmental systems, there are a number of ancillary design proposals. All the car parks are placed at the perimeter immediately adjacent to the main highway, and are shaded with more photovoltaics in multi-storey structures. The car then is excluded from entering the campus altogether. Instead, an internal transit system of automated (driverless) trams which follow low energy fibre-optic lines buried within the ground connect the hospitals to living spaces, to car parks, and to all the ancillary functions.

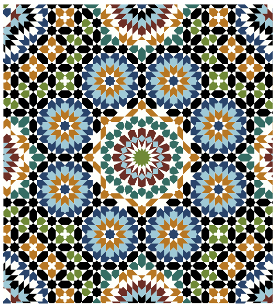
There is a central district cooling plant which uses the city's waste and combines with a de-salination plant. →



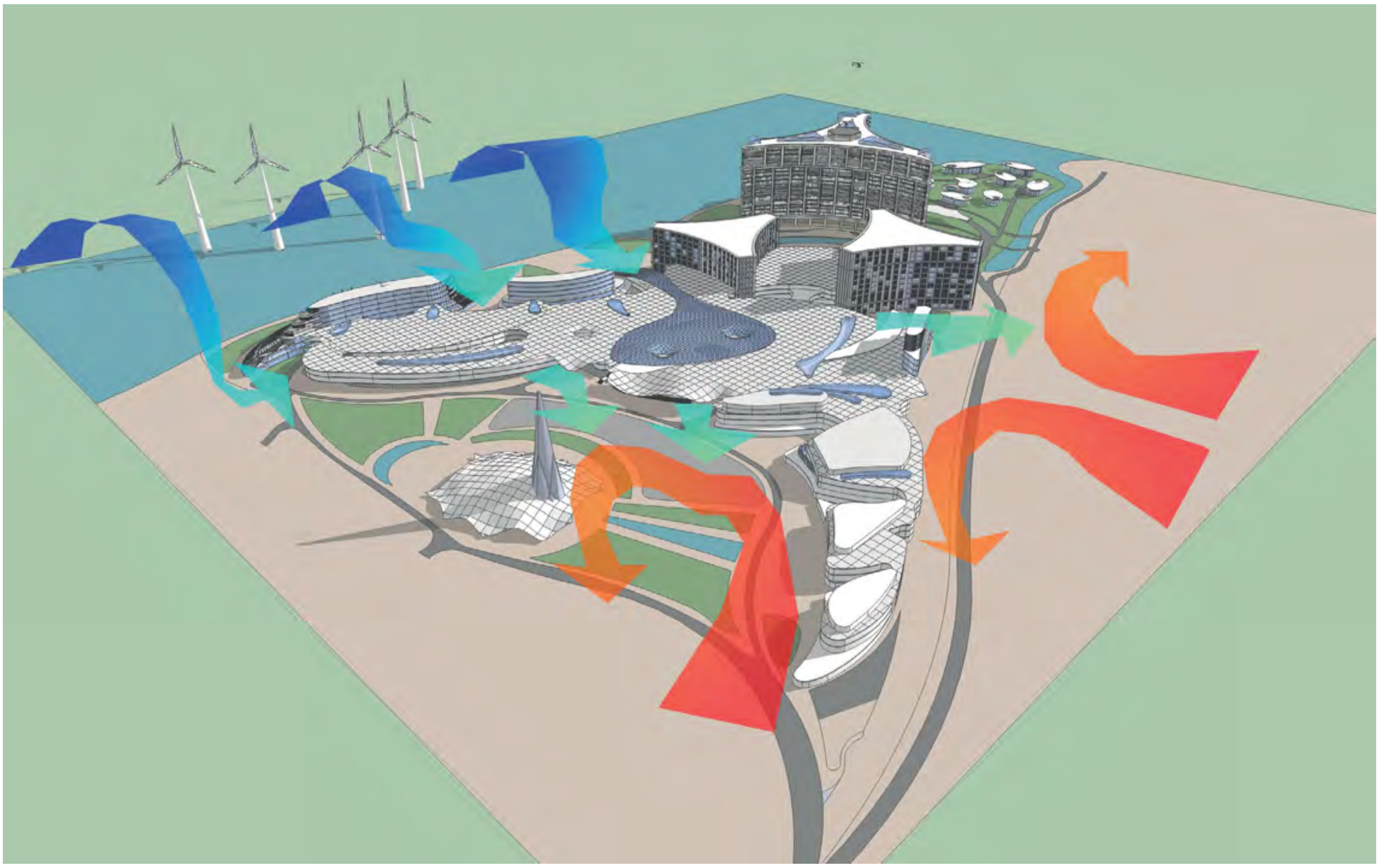
LEFT
Masterplan of Bahrain Medical City

ABOVE
Climate sections

CLOCKWISE FROM RIGHT
Bedouin tents; 3D climate sketch; Space shuttle tiles; Typical Arabic ceramic pattern



'Our first design move therefore was to join all the disparate elements together under a single roof – a free form abstract of the Bedouin tent. The roof of this was conceived to offer several passive environmental design strategies. The first was to act as shade or shield. The monumental roof in concrete is covered in ceramic tiles'



MALAYSIA

Our third case study looks at Scott Brownriggs scheme in Johor Bahru, Malaysia for the University of Reading. This has been led by Group Board Director, Michael Olliff, who also champions the education sector.

This project forms part of a wider education community in a huge academic campus – Edu City.

Michael describes the project and its location:

> Johor Bahru is 1° north of the equator. Its climate is classified as a tropical rainforest climate with no true distinct seasons. Owing to its geographical location and maritime exposure, its climate is characterised by uniform temperature and pressure, high humidity and abundant rainfall. The average annual rainfall is around 2,340mm. The temperature hovers around a diurnal range of a minimum of 23 °C and a maximum of 32 °C. May is the hottest month of the year, followed by April. This is due to light winds and strong sunshine during those months.

The project was a finalist in the 2013 World Architecture Festival Awards – Future Education category, an accolade that proves that an appropriate response to environmental design does not have to exclude wider design excellence.

In answer to the wider issue of climatic considerations being part of place and context, Michael states:

> Whilst many modern buildings in the region adopt an international style and ignore the environmental context, Scott Brownrigg was keen to exploit this local diversity and express it in the built form of the new campus for the University of Reading. The lack of temperature differential between night and day challenged us to reconsider our traditional approach of providing a building with high thermal mass. The result is an approach that draws inspiration from the traditional Malay house (Rumah Melayu) where the building is lifted off the ground to encourage airflow and natural cooling, and the façades are screened using perforated metal veils to limit solar heat gain. A large overhanging roof protects users from heavy downpours that are common most days and this overhang also contributes to the shading of the façades. An unexpected challenge to the team was due to the fact that Malaysia is an energy rich economy, and renewable technologies are uncommon and therefore expensive. We have therefore adapted traditional comfort cooling using chilled water throughout. The heat from the central chiller plant is rejected using multiple evaporative cooling towers. These use the cooling effect of evaporating water to boost the cooling provided by fresh air, and are powered by an array of photo-voltaic cells at roof level.

BELOW
University of Reading, Malaysia external view

A further essential design consideration in responding to the projects requirements, is that relative humidity has a diurnal range in the high 90% in the early morning, to around 60% in the mid-afternoon, but does go below 50% at times. During prolonged heavy rain, relative humidity often reaches 100%. Further contrasts that prevent true all-year uniformity are the monsoon seasons which happen twice each year. The first one is the Northeast Monsoon which occurs from December to early March. The second is the Southwest Monsoon season which occurs from June to September.

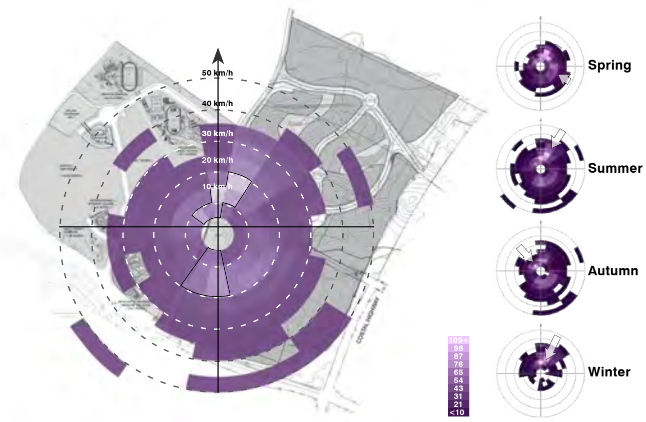
This informs the design which Michael explains:

> An approach of blending traditional passive techniques with renewable technologies to satisfy modern demands for air conditioned space has resulted in a building that has a significantly lower energy requirement than comparable commercial space. The east west orientation of the building was a key factor in reducing the heat load from solar gain and care was taken to ensure that all teaching spaces faced north or south.

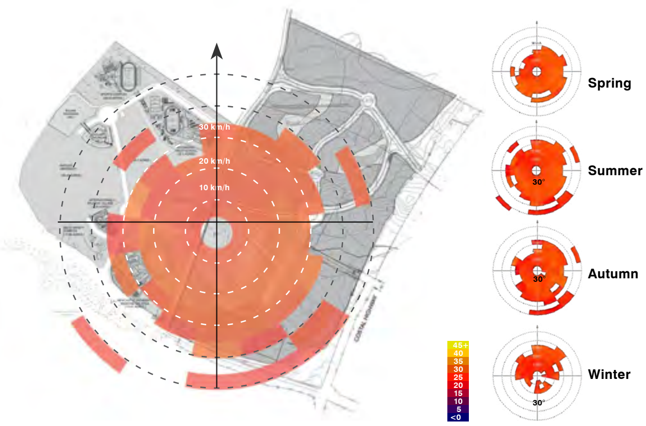
Finally, the way in which the building is designed needs to take into account the high humidity and rainfall of the South East Asian climate, which causes unsightly staining with a prevalence of mould and algae growth. Rainwater gutters and downpipes need to be significantly oversized to account for the torrential downpours and detailing of façades need to provide sufficient overhang. Metal components including stainless steel need to be carefully specified to protect against corrosion.

So, whilst we know that designing in such environments comes with a series of significant issues to be considered, a thorough investigation and critical analysis of the specific place gives us the appropriate precedent of patterns of development and climatic response. This can allow for design opportunities to be creative through the process of exploration. This combination of history and technology offers a wealth of material to generate building of excellence for our clients and the communities in which they are placed ●

WIND FREQUENCY: THE DIAGRAMS, BELOW RIGHT SHOW THE PREVAILING WIND DIRECTION (LONG ARROW) AND SHIFT ONE (SHORT ARROW) IN EACH SEASON. THE DIAGRAM BELOW LEFT REVEALS THE AVERAGE WIND DIRECTION OVER A YEAR AND HIGHLIGHTS THE TWO MAJOR WIND DIRECTIONS.

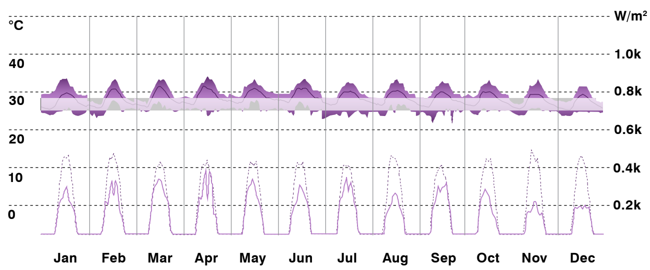


WIND TEMPERATURE: THE DIAGRAMS BELOW RIGHT SHOW THE WIND TEMPERATURE IN EACH SEASON. THE DIAGRAM BELOW LEFT REVEALS THE ANNUAL AVERAGE DATA.



WIND TEMPERATURE: THE DIAGRAM BELOW SHOWS TYPICAL DIURNAL TEMPERATURE VARIATION OF THE MONTH. THE WHITE BAND DISPLAYS THE COMFORT ZONE, THE SOLID PURPLE LINE REPRESENTS THE DIRECT SOLAR RADIATION OF THE MONTH, AND THE DOTTED LINE SHOWS DIFFUSE SOLAR RADIATION.

= COMFORT: THERMAL NEUTRALITY



LEFT

Wind frequency diagram; Wind temperature diagram; Temperature diagram; Ventilation diagram

Detail: The Elmgreen School

On its opening in September 2009, The Elmgreen School in West Norwood, London, part of the Lambeth BSF programme, was the first parent-promoted school in the UK. The design by Scott Brownrigg uses the analogy of a medieval square with buildings and learning areas grouped around a central market square. Here, Clark Barton examines the design and in particular the market square roof detail.

For the market square to be effective in our climate, a roof was required to transform it into a year-round external space. The challenge was to provide this large space with a tempered environment; one with a day-lit clear-span glass roof connecting the heart of the school with the outside.

The saw-tooth section of the glazed roof provides a breathtaking canopy with complete skyscape, while the timber batten detail to the courtyard walls and paving slabs to the floor provide the external environment references. The overall ambiance is calm and welcoming, creating a superb social gathering place.

Overheating in summer and high carbon dioxide levels are avoided by using BMS controlled openable lights in the sawtooth roof, a large temperature gradient created by the multi-storey space and low level ducted fresh air supplies. The opening lights and permanent ventilation permit the space to be classified as external for the purposes of means of escape.

The market square roof has been built with a Schuco glazing system using high performance glass from Pilkington. The glazing consists of 6mm clear, heat soaked, toughened glass with a 16mm argon gas cavity with silicone edge seal and an 8.8mm clear Low-E laminated layer.

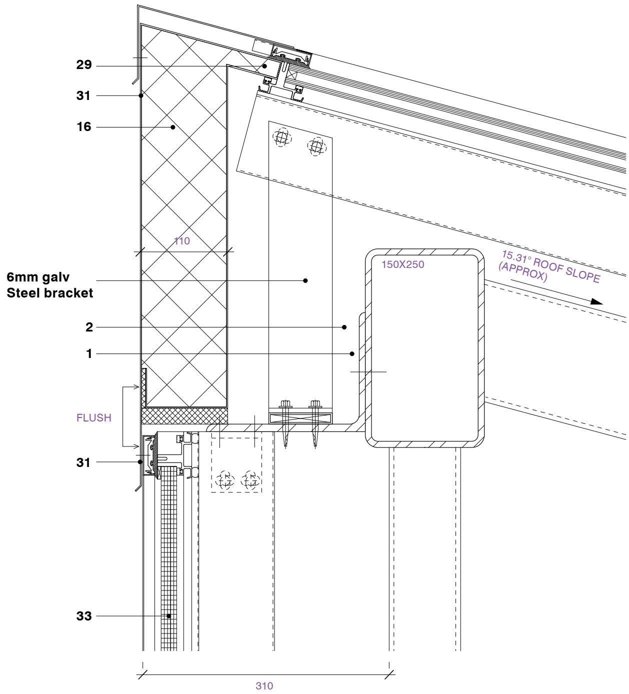
Suspended radiant heating panels heat surfaces rather than space and provide comfort during the winter with minimal energy use. Rain noise over the large roof area is limited by the geometry of the roof and the use of laminated glass in double glazed units.

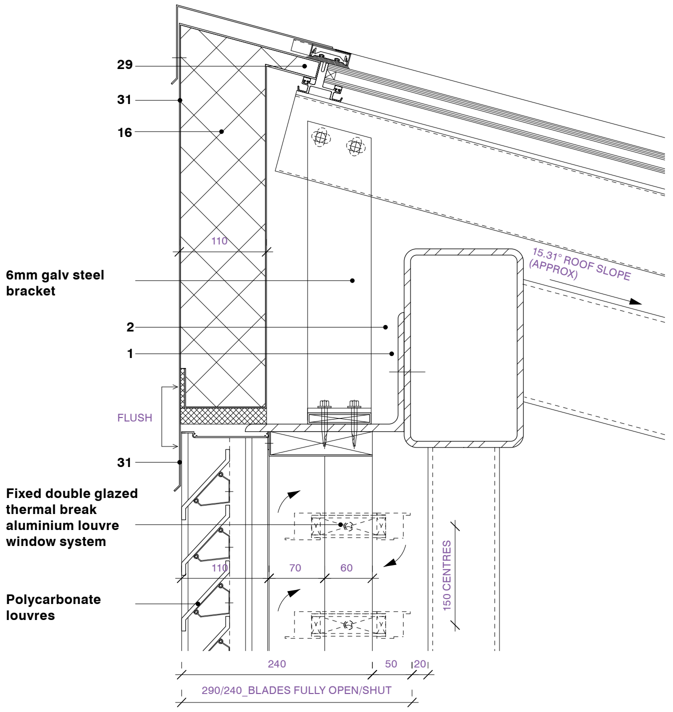
The school is also home to a Hearing Impairment Unit so it was paramount that the space was acoustically treated. This has been achieved with the inclusion of acoustic panels wrapping round on the balustrade and concealed behind the larch batten feature walls.

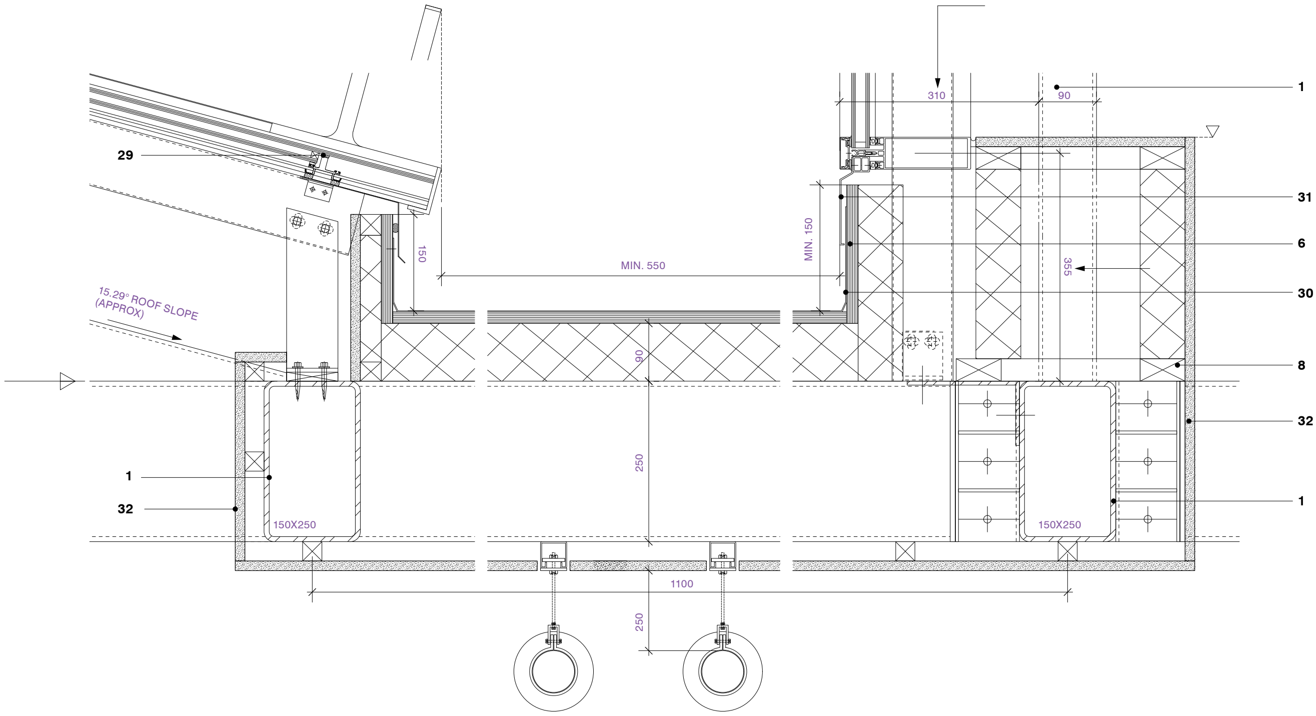
As a consequence the market square has space to support individual study and reflection, space for group discussions and role playing, a ‘classroom’ for traditional teacher-led activities as well as being the space for whole school assembly. The design encourages experimentation from the staff, students, parents and community ●

BELOW
The Elmgreen School Market Square

RIGHT
Market Square roof detail







KEY

1 Structural steel
2 Secondary steel support
3 Purlin
4 Specktradek insulated roof deck
5 Vapour barrier
6 WBP plywood
7 Graded softwood battens, preservative treated
8 Regularised softwood battens, preservative treated
9 Concrete structure
10 Primer on concrete deck
11 Two coats of Perma TEC waterproof coating incorporating Perma Flash-R reinforcement layer
12 PermaFLASH-D500 bonded in PermaTEC (rainwater outlet)
13 Perma GUARD F protection layer
14 Perma GUARD M protection layer (upstand)
15 Superflex T-O Anti rot
16 Supertherm XPS extruded polystyrene insulation board
17 Clamp ring outlet with gravel leaf guard
18 Terram Roofslat-R (cover to rainwater outlet)
19 Plasfeed ND 5+1 drainage moisture retention layer
20 Permanite growing medium
21 Paving to Science garden
22 Sedum blanket (extensive roof)/Wildflower mix
23 Washed stone ballast
24 Concrete paving slabs
25 Cementitous board to parapet upstands
26 Weathering to parapets
27 External rainscreen cladding
28 Spectraplan SG120 TPE waterproofing membrane
29 Patent roof glazing
30 Recessed valley gutter lining
31 Ancillary flashing
32 Painted plasterboard
33 Multiwall Polycarbonate
34 Rigid Polyisocyanurate foam (PRI roof board)

8

Design Competition: The Gondola

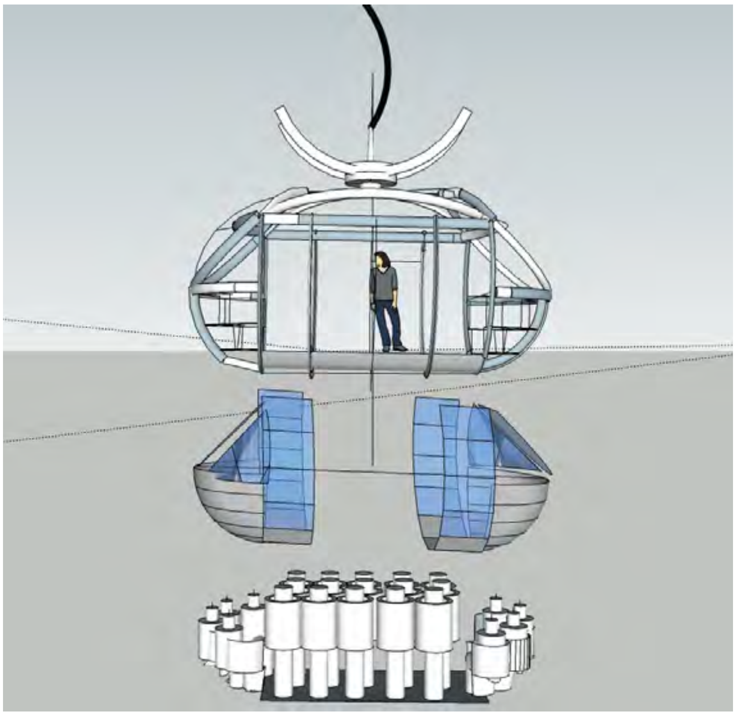
As part of our own research through design process, we have looked at ways in which ‘everyday’ objects and artefacts have (or perhaps have not) developed over their history. Such investigations have looked at the wheelchair and cutlery, as well as the listening pod; in this series the design of the gondola is the first to be published.

The brief was to ensure that the object could be used as a practical vehicle for mass transit as well as that for tourism; that the installation was not site specific; that the ‘cars’ could be stacked and mass produced; that each gondola should be capable of carrying 24 persons and that travel within one should be an experience of delight.

The field of investigation was not wholly without context to our practice. We are looking with a client at two confidential potential routes within cities in the UK that could provide both a benefit to tourism, as well as an integrated mode of transport as part of wider infrastructure projects.

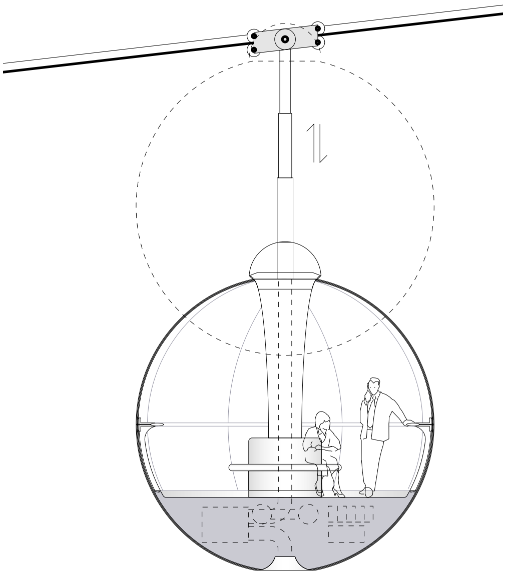
This project type is becoming a serious consideration as an appropriate mode of public transport, not just a way of getting you and your skis up a mountain. However, the tradition of the design approach in dealing with difficult topography can, it is suggested, be translated in dealing with the urban and built topography of our towns and cities.

The results of our internal competition range from the technically competent and entirely viable, to the witty and whimsical through to the clearly poetic. We placed an order to the submissions, but do not propose to reveal that here. We leave it up to you to decide which design has the ability to create a magical journey for you above the ground, in a vehicle which might just give you a new perspective of the world ●



LEFT FROM TOP

Philipa Hall entry; Saj Singhs’ ‘Carriage Gondola’: Stewart Gregory entry

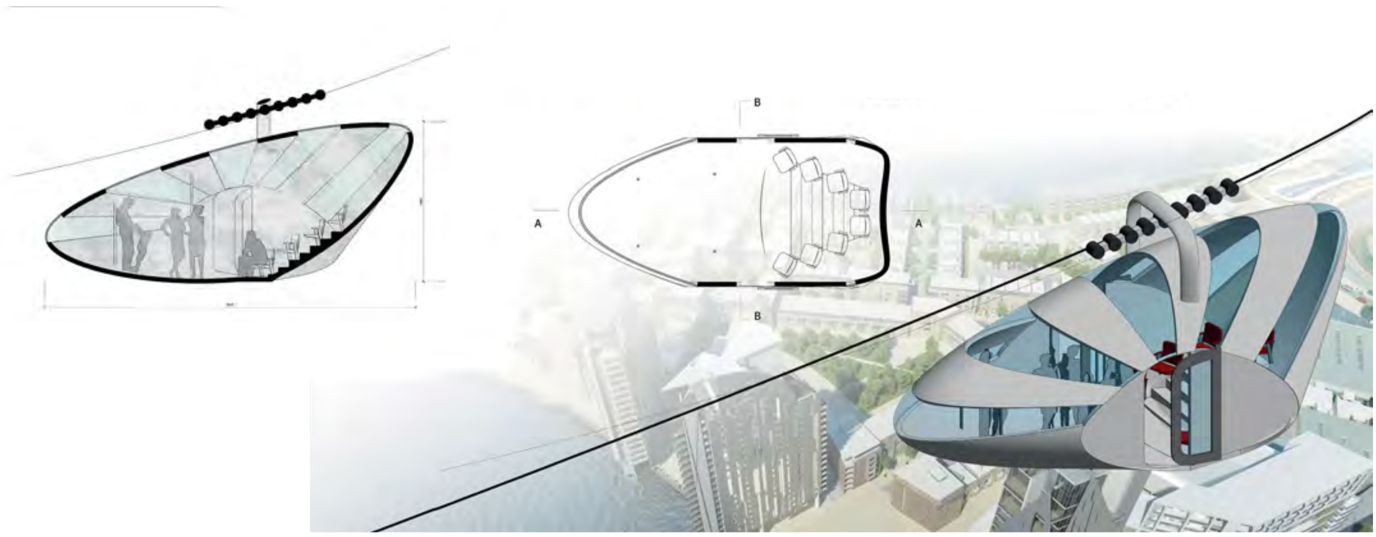


ABOVE

Ralph Isitts' 'Dew Drop

BELOW

Lawrence Ducks' 'Aurora-Car'



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