

The UK's 1st Carbon Negative Commercial Office

Vince Cable, Business Secretary called it an...

“ Extraordinary Building ”

November 2011



Project Supporting Statement

In 2009 Interserve Construction were working out of a 60 year old office, with cheap rents but the building was single glazed, poorly insulated, draughty and had an inefficient layout with no means of controlling the heating. The energy bills were increasing so fast that they exceeded the rental and continued to rise.

The decision was taken to build a new office and negotiations took place with Raynsway Properties with the intention of designing and building a new office on their Watermead Business Park and then rent it.



The site before construction

A chance guest speaker at the Interserve Annual Conference was Jonathan Hines, of Archytype, whose passion for Passivhaus was so infectious that instead of progressing down the proposed BREEAM route, Interserve recognised Passivhaus was the right way to go. It only took a very short explanation about the Passivhaus philosophy to convince Raynsway that this is where the future lay. The Design Team of CPMG Architects, Couch Perry & Wilkes, and BWB joined the rapid learning curve of designing to Passivhaus standards.



The design



The completed office

The Passivhaus concept evolves around ensuring the building is exceptionally energy efficient, this is achieved by ignoring traditional design ideas and focus entirely on reducing or eliminating energy in use by:-

Limiting heating demand to less than 15kWh/m² per annum (20% of Building Regs) by:-

- Orientating the building with (triple) glazing primarily on the south elevation maximising passive heating.
- Super insulating the building with 'U' values typically three times better than current Building Regulations.
- Utilising a very efficient heat recovery ventilation plant which recovers 80 to 85% of the heat from the stale air and adding to the cooler incoming air.



The heat recovery ventilation plant

Envelope:

$U \leq 0.15W/(m^2K)$

$U_w \leq 0.8W/(m^2K)$

Thermal bridge free

Air tightness:

$n_{50} \leq 0.6/h$

Intake air

Exhaust

Extract

Supply

Triple glazing:

$U_g \leq 0.8W/(m^2K)$

g-value 50 - 55%

Limiting cooling demand to less than 15kWh/m² per annum (20% of Building Regs) by:-

- Introducing Earth Tube Technology which lowers the intake air by around 6 Degrees C in summer and likewise introduces warmer air in the winter.
- Fitting intelligent external window blinds to the South elevation preventing unwanted heat entering the building in the summer months.
- Controlled opening of windows in summer when external temperatures are cooler than inside. The BMS indicates when it is appropriate to open windows on wall mounted telltales.

Limiting Primary Energy use to less than 120kWh/m² by:-

- Introducing intelligent lighting, localised control of lux levels and automatic movement sensor switching.
- The use of low energy lighting
- Low energy IT equipment
- Network printers replaced individual desktop printers



Screens located around the office as part of the BMS



Intelligent lighting and large area of glazing

“To have this work praised highlights the importance innovation and energy efficient construction plays in helping businesses.”

Gordon Kew, Director of UK regional Building for Interserve in response to Vince Cables, Business Secretary's visit

High levels of air tightness below 0.6 AC/ Hour (12 times better than Building Regs) by:-

- Appointing a Specialist Air tightness Consultant to advise
- Devising a series of robust but simple air-tight construction details
- Continuous rigorous checking of workmanship and compliance with agreed details
- A sense of pride and determination by all on site to ensure that the building was as airtight as possible
- Failure was not an option at this level of air tightness as it would be almost impossible to retrospectively go back and rectify any air leakage.
- We achieved an air tightness of 0.44 which is a further guarantee of quality materials and workmanship.



Ultra thick insulation to walls



Durisol blocks with built in thermal and acoustical insulation made from waste timber shavings

The Challenges

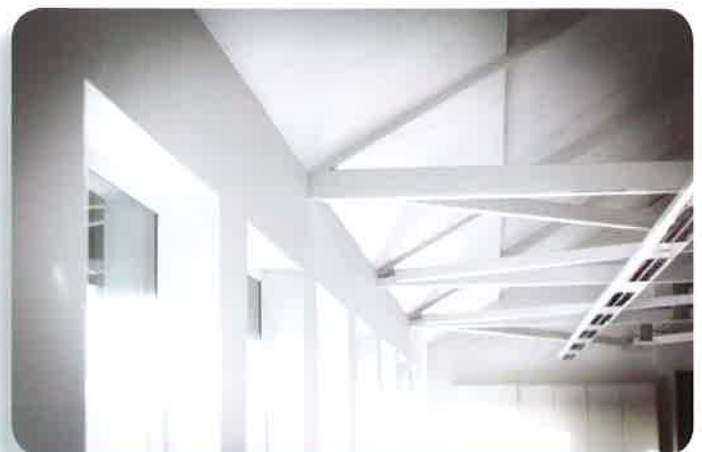
We embarked on a journey of discovery, whilst Passivhaus has been increasingly used in the UK for residential properties there was little experience with larger floorplates and a consequent lack of Passivhaus accredited equipment and product suppliers in the UK..

There was no Passivhaus accredited Mechanical heat recovery plant of sufficient size manufactured in the UK, the only one available was from Northern Europe. Following investigation and satisfying ourselves that we were buying a reliable unit we installed one from Austria. There are now a number of UK manufactured units going through the approval process which we are using on subsequent projects.

No Passivhaus accredited Triple Glazed units were available in the UK, but we discovered that an approved continental manufacturer had recently opened a small manufacturing plant in Wales and were able to arrange to have the UPVC sections brought across to Wales to be fabricated utilising British glass.

Thermal bridging- exclusion was carried to a new level of design and workmanship. We submitted our traditional guttering bracket detailing drawings to the Passivhaus Accreditors only to have them insist on a redesign to provide the requisite 300mm of insulation between the bracket and the internal face of the building.

Without comparables, the lease drafting posed interesting problems, particularly the rent review clause.





The Outcome

Initial energy cost predictions were that our bills would decrease from £23,336 per annum down to £3,000, but the addition installation of a 135m² Photovoltaic array would produce more energy than we would use and result in annual energy credit of around £2,800.

In reality we have been delighted to experience much better performance with a predicted annual energy credit of about £7,500 based on consumption to date. A saving of £30,000 per annum compared to our old office, with the added benefit of a further saving from the CRC tariff.

The additional rental cost for our new building compared to our old office is offset by the much more economical energy costs and of course our energy credits will be increasing in line with the increasing utility charges resulting in a reducing overall expenditure year on year for our office accommodation. A BREEAM equivalent office would never have been affordable to us and it is these extraordinary savings in energy costs from Passivhaus which when combined with our rental have actually reduced our total costs of occupation compared to our old and inefficient office.

The added bonus is that we now enjoy a brand new, bright, efficient and comfortable working environment, even with the extremes in temperature experienced since occupation the office has kept to the design temperature. We now work from an office to which we are all proud to invite Clients and guests, where we have had around 700 interested Construction professionals visiting to learn more about the experience since opening in September.

This has led to a significant number of further Passivhaus opportunities currently being processed in addition to our two Passivhaus schools nearing completion.

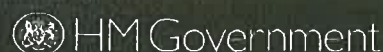
Raynsway Properties, recognised that Passivhaus is a much more marketable product than the BREEAM equivalent due to its built in quality and very low energy / running costs. The office is a much more attractive future rental proposition than its BREEAM counterparts. More Passivhaus schemes are being proposed with the intention of making Watermead the largest low carbon business park in the Midlands.

When the EPC details were sent to the BRE there was a certain disbelief of the negative emissions and the calculations had to be submitted before the EPC was issued.

We could not have afforded to build a BREEAM equivalent building as the running costs would have been so much more expensive and having lived in the Passivhaus Office since September appreciate that anything else would be a retrograde step.

Energy Performance Certificate

Non-Domestic Building



Interserve Construction Ltd.
Watermead Business Park
3 Rayns Way, Syston
LEICESTER
LE7 1PF

Certificate Reference Number:
 0510-0039-1409-4629-3092

This certificate shows the energy rating of this building. It indicates the energy efficiency of the building fabric and the heating, ventilation, cooling and lighting systems. The rating is compared to two benchmarks for this type of building: one appropriate for new buildings and one appropriate for existing buildings. There is more advice on how to interpret this information on the Government's website www.communities.gov.uk/epbd.

Energy Performance Asset Rating

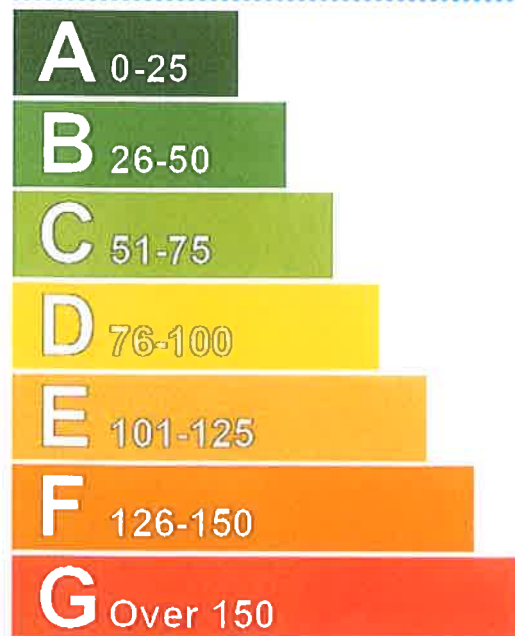
More energy efficient

A+

< -2

This is how energy efficient the building is.

Net zero CO₂ emissions



Less energy efficient

Technical information

| | |
|--------------------------------------------------------------|------------------------------------|
| Main heating fuel: | Other |
| Building environment: | Heating and Mechanical Ventilation |
| Total useful floor area (m ²): | 739.890 |
| Building complexity (NOS level): | 5 |
| Building emission rate (kgCO ₂ /m ²): | -1.05 |

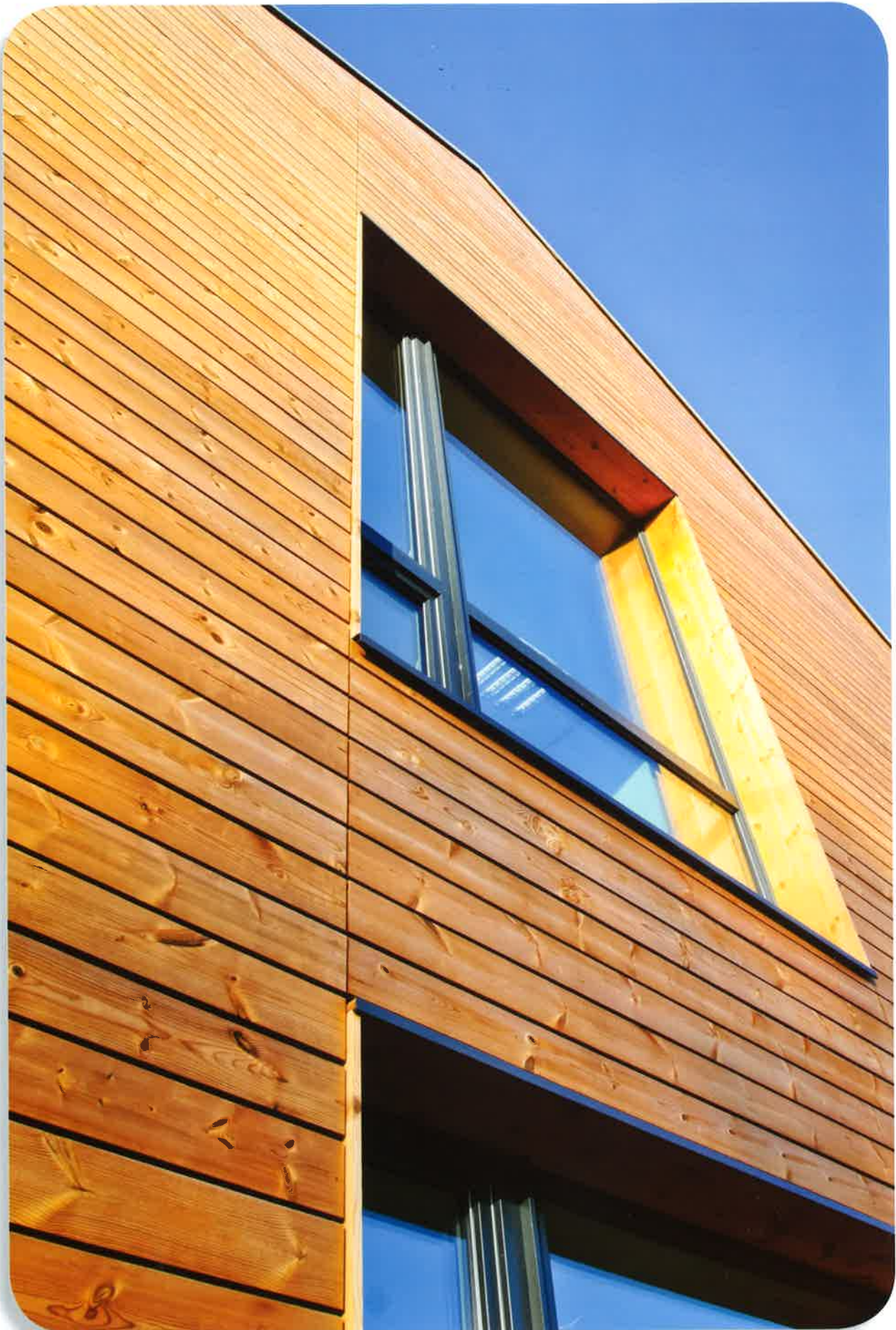
Benchmarks

Buildings similar to this one could have ratings as follows:

24 If newly built

65 If typical of the existing stock

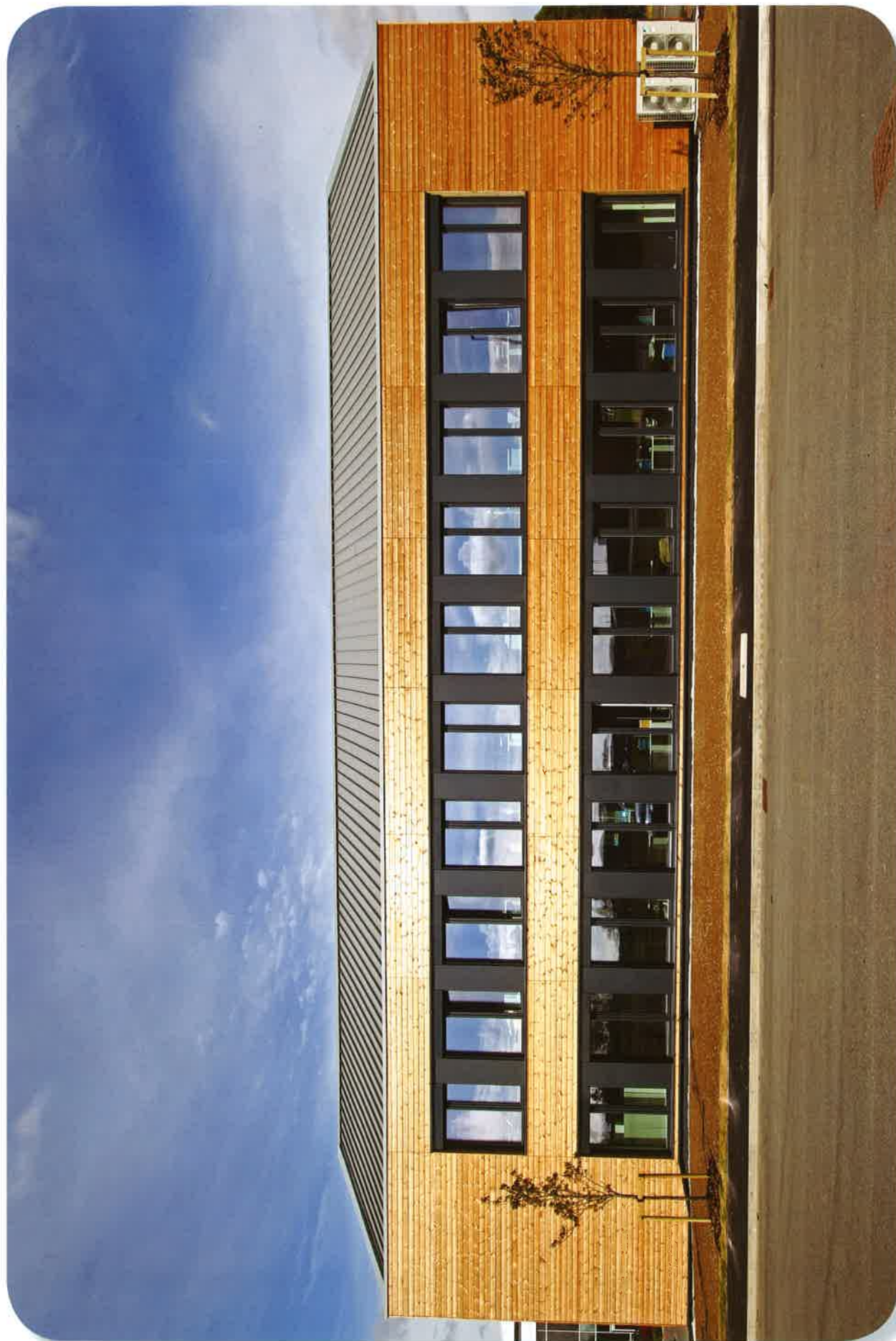












Watermead Business Park, Passivhaus Office Development

13.01.2011

Super air-tight construction to avoid heat loss through the external envelope

Triple glazed energy efficient window system to achieve very high levels of thermal performance and air tightness

Exposed thermal mass to assist with passive cooling

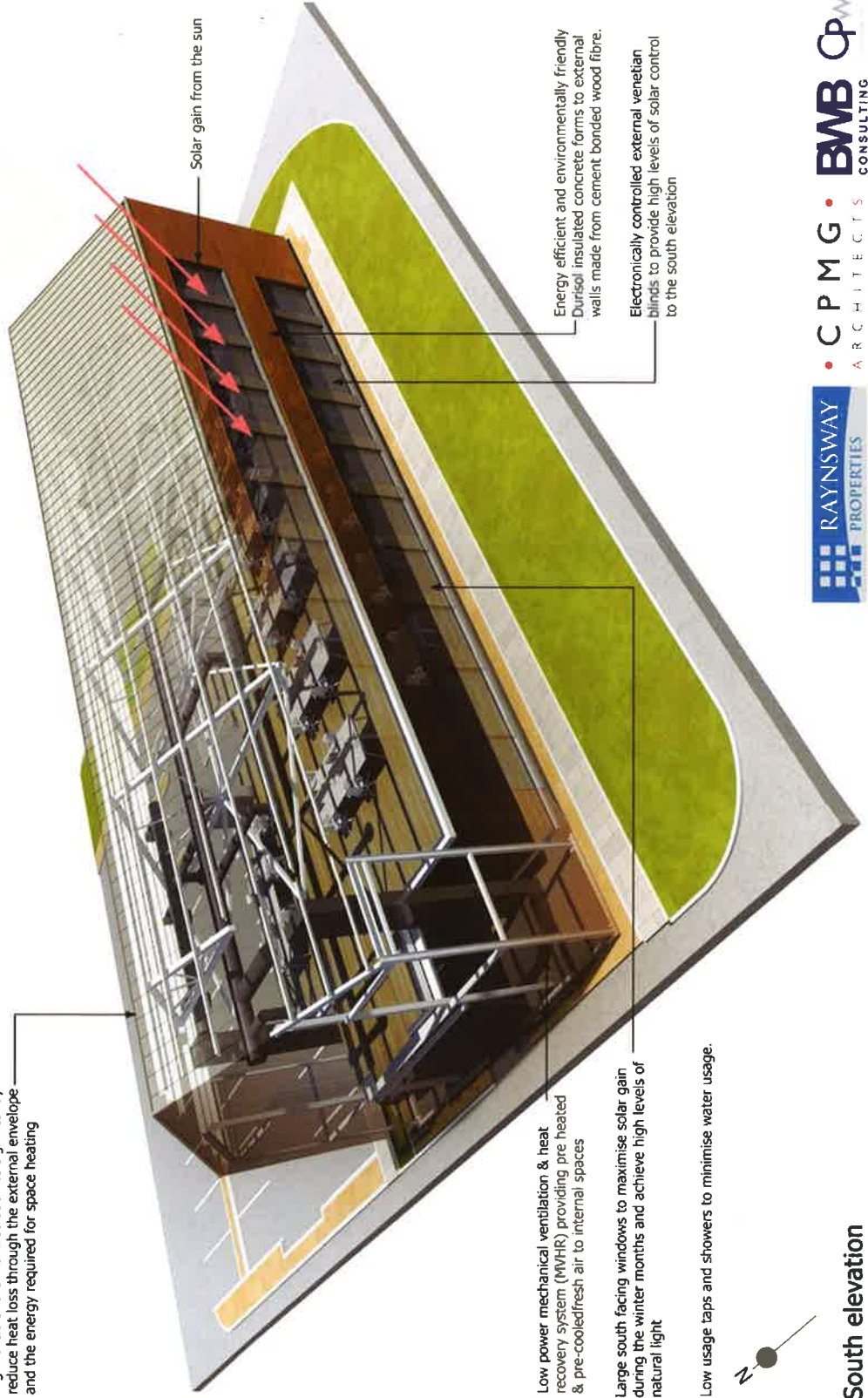


North elevation

Watermead Business Park, Passivhaus Office Development

13.01.2011

High levels of thermal insulation to significantly reduce heat loss through the external envelope and the energy required for space heating



South elevation

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