

# CARRINGTON BUILDING - Student Services Centre



## GROUND SOURCE HEAT PUMP PRESENTATION

# UNIVERSITY DEPT/CONTACT

The Carrington Building was Project Managed by the Project Department within the Facilities Management Directorate of the University of Reading.

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The project was managed within a Partnering Framework Agreement.

# THE PROJECT

The Carrington Building is a £6.5M investment by the University of Reading, built to offer further improvement to student support services.

The building has brought together support services previously housed in a number of locations across the University, and has introduced a Helpdesk facility to improve service provision.

Services housed within the Carrington Building include the following departments: Student Services, Careers Advisory Service, Study Advisors, Disability, Accommodation, and Counselling.

# PROJECTS and the ENVIRONMENT

For capital construction projects at the University of Reading, the inclusion of environmental engineering solutions in projects is led by the following,

1. University policy and commitment to environmental issues.
2. The professional involvement of design consultants.
3. Good practice.
4. Legislation
  - Building Regulations
  - Town Planning

# DESIGN CONCEPTS

The principle design concepts offering environmental solutions for the Carrington Building are:

- Building orientation to reduce solar gain in main occupied spaces.
- High level of insulation beyond the requirements of legislation.
- Natural ventilation to the majority of spaces.
- The use of a Ground Source Heat Pump system to heat the building.

# GEOHERMAL HEATING & THE BUILDING

The proposal for a Geothermal Heating system at the Carrington Building was introduced early in the design stages of the project.

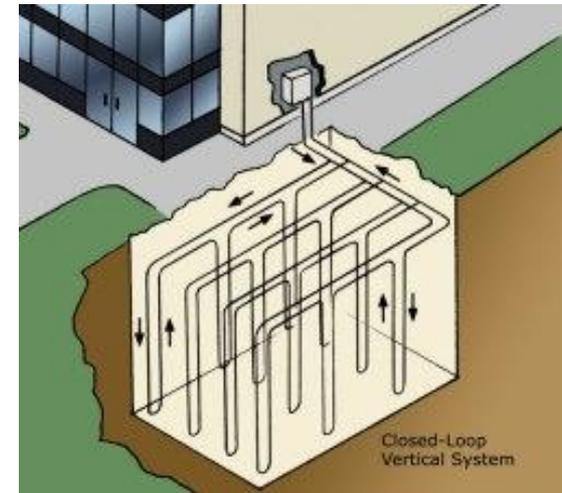
The benefits to the University of having such a system were identified as,

- CO2 savings
- Running cost benefits
- Life cycle cost benefits – low maintenance
- Quiet equipment
- Low space requirement for equipment

# GEOHERMAL HEATING PRINCIPLES

A CLOSED LOOP GROUND SOURCE HEAT PUMP SYSTEM WORKS ON THE PRINCIPLE OF DRAWING STORED ENERGY/HEAT FROM THE GROUND (VIA VERTICAL BOREHOLE PIPES) AND USING IT TO EXPAND A REFRIGERANT FLUID IN A CLOSED CIRCUIT. THE REFRIGERANT IS PUMPED THROUGH A CONDENSER WHERE IT TRANSFERS HEAT INTO THE CENTRAL HEATING CIRCUIT (UNDERFLOOR HEATING IN THIS CASE).

DURING THE SUMMER SEASON THE SYSTEM IS ABLE TO 'REVERSE CYCLE' RUNNING COLD WATER THROUGH THE UNDERFLOOR HEATING SYSTEM, DRAWING HEAT FROM THE ROOMS AND RETURN THIS HEAT TO THE GROUND. IN SUMMER THIS OFFERS A 1-2 °C ROOM TEMPERATURE REDUCTION TO THE NATURALLY VENTILATED SPACES.



# GSHP SYSTEM DESIGN

The Geothermal heating system at the Carrington Building is summarised as,

- A 'closed loop' system.
- Also offers cooling by 'reverse cycling' the system in Summer.
- Has 24 boreholes 100 metres deep.
- Heating/cooling is distributed via an underfloor heating system.
- Nil gas requirement for the building.

# GSHP SYSTEM EFFICIENCY

The use of the ground source heat pump system is recognised as offering the Carrington Building an efficient and environmentally efficient building with the following benefits,

- The heat pump offers a higher level of energy efficiency. The Coefficient of Performance (which measures the ratio of units of heat given out against the quantity of units of electricity) is CoP of 3 to 4 .
- Expected CO<sub>2</sub> savings of 10 tonnes per year (a saving of 40% compared with a gas fired condensing boiler).
- Coupled with the building's strategy for natural ventilation, the reverse cycling of the GSHP system offers additional energy consumption reduction during the Summer season.

# SITE OPERATIONS

FROM THIS.....



TO THIS.....



24 no. individual boreholes were drilled to install the ground loop circuit. Upon completion the University of Reading Grounds Department created a wild meadow at the borehole field location.

## OTHER SITES

The following are examples of other clients and sites which propose or have installed a geothermal heating system:

- Gloucester Police Station.
- Malvern Hills Science Park.
- Liverpool South Parkway.
- Dunston Business Park.
- Keble College, Oxford.

## USEFUL WEB-SITES

The following are related useful web-sites ,

[www.gshp.org.uk](http://www.gshp.org.uk)

[www.carbontrust.co.uk](http://www.carbontrust.co.uk)

[www.energysavingtrust.org.uk](http://www.energysavingtrust.org.uk)

The installer of the Carrington system:

Geothermal Heating (International) Limited

T: 02476 673131

W: [www.geoheat.co.uk](http://www.geoheat.co.uk)