

Innovative Design Features

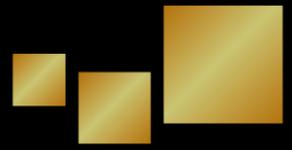
The Hive is a building that responds to its brief and setting, and uses sustainable materials that will endure. It is accessible by all people, provides a safe environment and is welcoming to anyone who comes through the doors. To help users identify where they feel most comfortable, each area with the Library and History Centre is defined by colour, lighting and acoustics to create distinct and appropriate zones.

Sustainability has been central to our design approach and has been a primary influence on all design decisions. We have sought to make the building form and fabric temper the internal environment, thus minimising the need for mechanical systems. Where these are required they have been specified to have a minimal environmental impact and to make maximum use of renewable resources. The building is designed to be well sealed and insulated to avoid incidental losses, and glazing and shading devices are orientated to minimise unnecessary gains. The building makes maximum use of controlled natural light and ventilation with controls and local manual override to ensure the comfort of users throughout the building. Materials have been selected to minimise embodied energy and generation of toxins in manufacture, use and ultimate disposal. Where possible materials will be recycled and locally sourced and the design allows for the building structure and fabric to be recycled at the end of its life. Water use is minimised by the specification of water saving fittings and the recycling of grey water. Green travel is facilitated via cycle parking, provision of staff showers and excellent connections to public transport.

The building is designed to facilitate sustainable operation: from its use of renewable energy to the provision of exemplar recycling facilities throughout, it demonstrates best practice. It has been designed to be a didactic building, educating staff, users and visitors and influencing a new generation of public buildings in Worcester and beyond.

We have used appropriate building design and “passive engineering” before we consider any dynamic (active) systems that may be necessary to further control the internal environment. The passive design strategy includes high levels of thermal insulation, good airtightness, use of daylight and natural ventilation coupled with exposed thermal mass. Shading devices and solar control glass are used where appropriate to limit gains from the sun and so reduce the loading on the cooling systems. Once the building loads have been reduced as much as possible by passive means, active systems are then be used to meet the remaining demand and provide any additional space conditioning required in an efficient manner as possible. Energy saving active systems such as variable speed pumps and fans, lighting controls and a building management system are all used.





Natural Ventilation & Summertime Cooling Strategy

The general principle is to introduce air around the perimeter of the building through opening windows. Air makes its way towards the main atrium and other voids where it rises to roof level and is exhausted through the roof vents. The driving pressure is generated by a combination of the stack effect (buoyancy driven warm air rises) and the wind effect. The roof outlets have been designed to provide either a neutral or negative pressure at roof level regardless of either wind speed or wind direction. Therefore they provide a pressure in the same direction as the stack effect such that any wind will aid the ventilation strategy. Furthermore, high level shading within the rooflights cause the top two or three meters of the roof void to heat up and act as a solar chimney, further increasing the driving pressure for air to leave via the rooflight.

A large below-ground duct is also provided to supply air naturally to the bottom of the main atrium space. It runs from the West edge of the building, and as it is constructed from concrete also allows some pre-cooling of the air.

The predominant wind direction is from the South-West which means that air will be blown over the river and the water meadow provided as part of the landscape in front of the building. There is some degree of evaporative cooling which reduces the air-temperature of the incoming air.

Exposed concrete soffits provide the majority of the thermal mass and these are pre-cooled by the night-time cooling strategy. In very hot weather when the natural ventilation can no longer maintain the required conditions, cool water (fed by the river cooling system described below) is circulated around either chilled beams or pipes embedded in the concrete slab to provide further cooling.

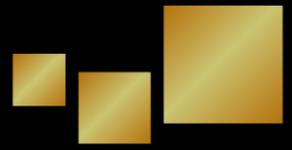
Daylight Strategy

The building design has been developed to make maximum use of daylight, both to provide an exemplary environment and also to reduce energy consumption. Artificial lighting typically represents around 30% of a building's energy use, therefore good use of daylight can have a significant effect in reducing carbon emissions.

Whilst we need to exclude direct sunlight where possible to limit solar gains, it does need to be allowed into the building in certain locations to provide a dynamic and pleasant environment. Therefore shading is used as appropriate to balance these two conditions.

The atrium and voids cut into the floor plate to allow daylight to penetrate from the rooflights down to the floors below and deep into the building form. The principle is to try to light all spaces from two sides and so provide higher and better distributed light levels.





Renewable Energy Strategy – Biomass Heating and River Water Cooling

Biomass boilers have been used for a number of years and are well proven technology. They burn organic material and use the resultant heat in the building. Since the organic plant matter has absorbed carbon dioxide as it grows; when it is burnt it releases the same carbon dioxide back into the atmosphere. Therefore as long as the energy involved in processing and transporting the fuel is relatively limited, it is considered a carbon neutral fuel.

Although the building is naturally ventilated and so will maintain the required thermal conditions passively for much of the year, there are times of the year when some additional cooling may be required. There are also areas of the building which are more densely occupied and so will require cooling more often. We have developed a strategy which uses the River Severn as a heat sink. Water is pumped from the river to the building, passed through a heat exchanger and then returned to the river at only a few degrees warmer. On the other side of the heat exchanger, water is pumped around the building and used to cool the concrete slabs; the water inside the building is kept hydraulically separate from the river water to prevent contamination and blockages.

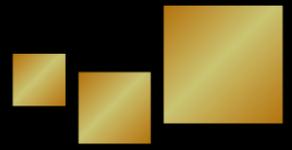
Water Management Strategy

The building takes full advantage of onsite water resources in order to reduce mains water demand. The most cost-effective strategy is rainwater harvesting to serve the WC flushing and archaeological washing requirements. Neither of these requires potable water and so can be fed from harvested rainwater with minimal treatment. They also represent the greatest consumptive use within the WLHC and are therefore the best candidates for savings, both in terms of economics and sustainability.

Planting & Urban Ecology

Planting plays a pivotal role in the proposed landscape scheme. It provides a structural framework and aids orientation as well as improving climatic conditions and providing welcome respite within a harsh urban environment. The seasonal variation of the plants throughout the year provides a constantly changing backdrop whilst the careful selection of species ensures an ecologically rich and sustainable landscape. In addition, planting is used to provide a reference to the cultural history of the site, providing a living reminder of a forgotten landscape or tradition. Planting and urban ecology are closely intertwined; working together to create a micro-ecosystem that is full of interest and delight.





For seasonal interest and diversity of habitat, and to act as flood attenuation, two water meadows are proposed along the western elevation of the new building. These will be planted with a range of native wildflower species, based on communities found locally in traditional lammas meadows. Worcestershire's county flower, the cowslip, will be planted en masse throughout, whilst predominately summer flowering species will be planted in the southern basin and predominately spring flowering species in the northern basin, highlighting the seasonal life of a traditional water meadow.

In all, over 4000m² of the soft landscape are dedicated to enhancing the biodiversity of the site. These habitats will be complemented by a number of innovative wildlife features to provide bird nesting, bat roosting and stag beetle hibernacula opportunities. The landscape provides for interaction between people and wildlife through proximity, interpretation and interactive features, and it is envisaged that the landscape will be as much a part of the learning resource and experience as the books and exhibits within the building.

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