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Energy-efficient conservation at the National Trust

Recent repair and rehabilitation schemes for a former snuff mill and a ruined farmhouse illustrate the National Trust's approach to conserving non-renewable resources.

Historic environment conservation is based on the sustainable management of unique and irreplaceable resources, whether historical, archaeological, cultural or scientific. Sustainable management must balance the needs and aspirations of use with those of conservation, reflecting the dynamic and evolving nature of buildings, accommodating, in all but a few show-case buildings, some inevitable change.

The standard conservation mantras concern minimal intervention, respect for integrity, avoiding devaluing or falsifying significance, and making changes both sympathetic and reversible. How often are those incantations used to the exclusion of environmental benefits?

Listed building legislation does not preclude many environmental improvements. With leading organisations, including English Heritage and the National Trust, promoting environmental integration policies, building conservation should no longer be perceived as elitist. Inevitably there will be conflicts. But with a coordinated, integrated approach a successful and sensitive balance can usually be achieved, often without compromising significance.

Energy conservation, a younger conservation sibling, increasingly presses for change. We can no longer merely add loft insulation or double glazing to satisfy our environmental obligations.

Environmental conservation encompasses not only traditional heat savings but ranges more widely. It includes the provision and expenditure of energy during manufacturing processes and delivery; through waste generation and disposal; during construction, repair and refurbishment; during operational use; and ultimately in re-use.

Two recent repair and rehabilitation schemes illustrate the National Trust's approach.

Morden Snuff Mill, now an environmental education and interpretation centre

Solar water pre-heating panels, sympathetically installed to reflect industrial rooflights

Morden Snuff Mill

At Morden in south London a former snuff-mill was rehabilitated to provide environmental interpretation and education facilities. Listed at Grade II, it was constructed of mass-brickwork under a slate roof. There was no contemporary mechanical evidence, but evidence remained of scale and arrangement.

The improvement scheme used roof-mounted solar water pre-heating panels, fitted to reflect historic industrial rooflights. These feed a high-efficiency gas condensing-combi boiler. The system is complemented by thermal storage within mass-masonry walls, enabling stable ambient temperatures, with minimised heat loads.

The reduction of heat transmission was a priority. Inert recycled newspaper insulation was used in the roof void and secondary glazing in non-sensitive zones. Modern glazing with low-emissivity glazing was used in sensitive historic areas. Internal draught lobbies and reproduction door closers created thermal buffer-zones to minimise heat leakage.

There was insufficient funding for photovoltaic slates and it was not feasible to use a water turbine in the adjacent river (although new technologies may make this possible).

Demand has been reduced by means of a common mechanical extract ventilation system where passive-stack ventilation proved inadequate. Fluorescent high-efficiency lighting is operated by sensors and timers in areas that are occupied only intermittently.

Internal areas are lighted by sensitively designed internal glazed partitions. Effluent pumps allow toilets to be situated on the ground floor within the modern zone, making them as accessible as possible.

Water has been conserved by using low-flush WCs, waterless urinals, and wash-basin taps with flow restrictors and auto-off fittings. The utilitarian nature of the fittings complements the building's industrial character. Rainwater-harvesting barrels have been provided to demonstrate the simplicity of water conservation to the wider public, and provide facilities to wash boots and equipment. Locally sourced and recycled materials and environmentally friendly materials were used.

The completed building provides a fully accessible environmental education centre, providing a place from which to preach the environmental gospel to a predominantly younger audience. The building was used for the launch of the government's 'education outside the classroom' manifesto in 2005.

Ankerwycke Farmhouse

The repair and restoration of a fire-damaged, brick-and-tile, historic farmhouse, for some years unoccupied, provided a near-blank canvas for incorporating many environmental design measures. The scheme builds on earlier experience at the snuff mill.

Although the building was unlisted, the measures would easily translate to a listed building in similar circumstances. Ironically, the fire exposed and burnt through evidence of a largely intact earlier building sequence, which would have justified listing.

Due to programme constraints, and without internal access, a preliminary scheme was designed based on condition surveys while stabilisation and clearance progressed.

Having established the need for dry-lining to mitigate aggressive salt activity, 'super insulation' could be added to the walls without intrusion. Coupled with recycled newspaper insulation to the roof void, triple glazing, and careful design to minimise air leakage, a highly insulated outer shell will allow the building to be heated quickly. This will minimise the energy demand on the roof-mounted pre-heater panels within the inner roof valley and on the high efficiency boiler. Further energy reductions are proposed using compact pipework and low-level radiant heating.

Energy demand will be reduced by maximising natural and borrowed lighting; using energy-efficient lighting; installing a sun-pipe routed to the inner roof valley; and providing a photo-voltaic panel to power roof-panel pumps and controls. Sensor light-switches and a common extract ventilation system are not appropriate to the domestic setting.

Water is to be conserved by using low-flush WCs and regulated taps. Mains pressure atomising shower heads have been specified in preference to power showers.

Rainwater runoff will be harvested by a new storage tank, to supply appliances and for WC flushing. This will create a small additional electrical load. Waste will be separated and recycled during construction.

The design allows for the ground-floor to be adapted for a disabled person. Ducting is positioned behind skirtings to allow service upgrades with minimal intervention.

Almost a blank canvas for conservation

The restorative scheme has now been designed and tenders have been returned. The scheme will remain flexible to accommodate new ideas and technologies. The scheme is designed to cause the minimum harm to both environment and occupants, providing a healthy place to live, with minimal toxic chemical and biological effects from modern building processes.

Environmental conservation carries little statutory force, but it makes good business sense and should be integral to building conservation projects. Whether or not this happens will depend on market forces and political inclination.

The needs of historic buildings need to be balanced against environmental benefits. Conservation inevitably entails extra costs, but grants are available. The industry needs to work more flexibly and openly, based on informed opinion. Inevitably, in an evolving discipline, we are still learning what to do, and where. Every scheme adds to the pool of knowledge, but we are lacking a means of coordinating and disseminating that information. Our mission is to understand and sympathetically integrate energy conservation as a complementary discipline.

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