

Section 9.9_ Handout 1

Planning and Climate Change Review Panel Activity Instructions

Instructions

You are part of a panel undertaking a design review for the proposal for Mercer Gallery, Harrogate.

You are considering the proposal from the perspective of the benefits in terms of bringing the heritage asset back into use whilst ensuring the maximum possible benefits from climate change adaptation and mitigation measures.

Based on what you have heard and the materials provided your task is to critique the proposed scheme for this Listed Building and challenge whether it could do more to maximise energy efficiency.

As a group consider the following aspects of the design:

1. Insulation
2. Ventilation
3. Glazing
4. Energy supply
5. Concerns of yours.

How do these relate to the other planning considerations that you would be balancing in a decision on the proposal?

How does it relate to national and local policy? (set out below)

National and Local Planning Policy

National Planning Policy Framework, March 2010

Section 10: Meeting the challenge of climate change, flooding and coastal change

Planning plays a key role in helping shape places to secure radical reductions in greenhouse gas emissions, minimising vulnerability and providing resilience to the impacts of climate change, and supporting the delivery of renewable National Planning Policy Framework and low carbon energy and associated infrastructure. This is central to the economic, social and environmental dimensions of sustainable development.

Local planning authorities should adopt proactive strategies to mitigate and adapt to climate change, taking full account of flood risk, coastal change and water supply and demand considerations.

To support the move to a low carbon future, local planning authorities should:

- plan for new development in locations and ways which reduce greenhouse gas emissions;
- actively support energy efficiency improvements to existing buildings; and
- when setting any local requirement for a building's sustainability, do so in a way consistent with the Government's zero carbon buildings policy and adopt nationally described standards.

In determining planning applications, local planning authorities should expect new development to:

- comply with adopted Local Plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and
- take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

To help increase the use and supply of renewable and low carbon energy, local planning authorities should recognise the responsibility on all communities to contribute to energy generation from renewable or low carbon sources. They should:

- have a positive strategy to promote energy from renewable and low carbon sources;
- design their policies to maximise renewable and low carbon energy development while ensuring that adverse impacts are addressed satisfactorily, including cumulative landscape and visual impacts;
- consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure the development of such sources;
- support community-led initiatives for renewable and low carbon energy, including developments outside such areas being taken forward through neighbourhood planning.

Section 12: Conserving and Enhancing the Historic Environment

26. Local planning authorities should set out in their Local Plan a positive strategy for the conservation and enjoyment of the historic environment, including heritage assets most at risk through neglect, decay or other threats. In doing so, they should recognise that heritage assets are an irreplaceable resource and conserve them in a manner appropriate to their significance. In developing this strategy, local planning authorities should take into account:

- the desirability of sustaining and enhancing the significance of heritage assets and putting them to viable uses consistent with their conservation;
- the wider social, cultural, economic and environmental benefits that conservation of the historic environment can bring;
- the desirability of new development making a positive contribution to local character and distinctiveness; and
- opportunities to draw on the contribution made by the historic environment to the character of a place.

128. In determining applications, local planning authorities should require an applicant to describe the significance of any heritage assets affected, including any contribution made by their setting. The level of detail should be proportionate to the assets' importance and no more than is sufficient to understand the potential impact of the proposal on their significance. As a minimum the relevant historic environment record should have been consulted and the heritage assets assessed using appropriate expertise where necessary. Where a site on which development is proposed includes or has the potential to include heritage assets with archaeological interest, local planning authorities should require developers to submit an appropriate desk-based assessment and, where necessary, a field evaluation.

129. Local planning authorities should identify and assess the particular significance of any heritage asset that may be affected by a proposal (including by development affecting the setting of a heritage asset) taking account of the available evidence and any necessary expertise. They should take this assessment into account when considering the impact of a proposal on a heritage asset, to avoid or minimise conflict between the heritage asset's conservation and any aspect of the proposal.

29 The principles and policies set out in this section apply to the heritage-related consent regimes for which local planning authorities are responsible under the Planning (Listed Buildings and Conservation Areas) Act 1990, as well as to plan-making and decision-taking.

131. In determining planning applications, local planning authorities should take account of:

- the desirability of sustaining and enhancing the significance of heritage assets and putting them to viable uses consistent with their conservation;
- the positive contribution that conservation of heritage assets can make to sustainable communities including their economic vitality; and
- the desirability of new development making a positive contribution to local character and distinctiveness.

132. When considering the impact of a proposed development on the significance of a designated heritage asset, great weight should be given to the asset's conservation. The more important the asset, the greater the weight should be. Significance can be harmed or lost through alteration or destruction of the heritage asset or development within its setting. As heritage assets are irreplaceable, any harm or loss should require clear and convincing justification. Substantial harm to or loss of a grade II listed building, park or garden should be exceptional. Substantial harm to or loss of designated heritage assets of the highest significance, notably scheduled monuments, protected wreck sites, battlefields, grade I and II* listed buildings, grade I and II* registered parks and gardens, and World Heritage Sites, should be wholly exceptional.

133. Where a proposed development will lead to substantial harm to or total loss of significance of a designated heritage asset, local planning authorities should refuse consent, unless it can be demonstrated that the substantial harm or loss is necessary to achieve substantial public benefits that outweigh that harm or loss, or all of the following apply:

- the nature of the heritage asset prevents all reasonable uses of the site; and
- no viable use of the heritage asset itself can be found in the medium term through appropriate marketing that will enable its conservation; and
- conservation by grant-funding or some form of charitable or public ownership is demonstrably not possible; and
- the harm or loss is outweighed by the benefit of bringing the site back into use.

134. Where a development proposal will lead to less than substantial harm to the significance of a designated heritage asset, this harm should be weighed against the public benefits of the proposal, including securing its optimum viable use.

136. Local planning authorities should not permit loss of the whole or part of a heritage asset without taking all reasonable steps to ensure the new development will proceed after the loss has occurred.

140. Local planning authorities should assess whether the benefits of a proposal for enabling development, which would otherwise conflict with planning policies but which would secure the future conservation of a heritage asset, outweigh the disbenefits of departing from those policies.

Companion Guide to PPS 5

Policy HE1: Heritage assets and climate change

21. The historic environment has an important role to play in addressing climate change. **The retention and reuse of heritage assets avoids the material and energy costs of new development.** Many older settlements reflect good practice in sustainable urban design. They have compact layouts; co-locate employment, residential, retail and leisure uses; and, are usually near to transport nodes. The historic environment can inform and inspire the best modern, sustainable development.

22. By taking a narrow and rigid view of what makes a building or development sustainable, opportunities may well be missed to adapt and enhance what is already there. In considering development proposals, local authorities will find it useful to take into account the embodied energy within existing buildings and the whole-life costs of any new scheme or proposed alterations. The creative adaptation of heritage assets can dramatically reduce the whole-life energy costs and waste impacts that would result from demolition and replacement, even where the proposed development would in itself be of an acceptable standard in terms of energy performance. The adaptation of heritage assets need not be more expensive or difficult than replacement. It is quite possible that the recycling of existing buildings at a site may cut the overall financial cost of development and even save time

Harrogate Borough Council, Relevant Core Strategy Policies

Policy EQ1: Reducing Risks to the Environment

In partnership with the community, the development industry and other organisations, the level of energy and water consumption, waste production and car use within the District, and the consequential risks for climate change and environmental damage will be reduced through the following:

a) The planning, design, construction and subsequent operation of all new development should seek to minimise:

- energy and water consumption;
- the use of natural non-renewable resources; travel by car;
- flood risk;
- waste;

b) Until a higher national standard is required, all new development requiring planning permission should: for residential development (excluding extensions)

- attain the following levels of the Code for Sustainable Homes (Department of Communities and Local Government (DCLG), 2006):
 - up to 2010: Code level 3
 - 2011 to 2015: Code level 4

- 2016 onwards: Code level 6

for other types of development

- attain 'very good' standards as set out in the Building Research Establishment Environmental Assessment Method (BREEAM);

c) Proposals for renewable energy projects will be encouraged, providing any harm caused to the local environment and amenity is minimised and clearly outweighed by the need for and benefits of the development.

Policy EQ2: The Natural and Built Environment and Green Belt

The District's exceptionally high quality natural and built environment will be given a level of protection appropriate to its international, national and local importance. In addition, more detailed protection and where appropriate enhancement measures will be applied through the Development Control Policies DPD, relevant management plans and by working in partnership with landowners and interested parties.

Subject to the District's need to plan for new greenfield development, the landscape character of the whole District will be protected and where appropriate enhanced.

The extent and detailed boundaries of the West Yorkshire and York Green Belts in the District will not be changed. Where criteria based planning policies cannot provide the necessary protection, local landscape designations will be identified:

- to protect the high quality of the landscape which is important to the setting of the towns of Harrogate, Knaresborough and Ripon;
- to protect those 'green wedges' in Harrogate town which are an important part of its character and distinctiveness;
- to protect appropriate green space within the main built up areas of Group A, B, and C settlements listed in Policy SG2 of this Core Strategy.

Priority measures to protect and enhance the District's natural and built environment are to:

- increase wildlife habitats and species in accordance with the District's Biodiversity Action Plan;
- review and update the Council's local Sites of Importance for Nature Conservation;
- improve the conditions of the District's Sites of Special Scientific Interest;
- carry out appraisals of the District's Conservation Areas incorporating measures for the protection and enhancement of their special interest;
- reduce the number of 'Buildings at Risk'; and
- ensure that new development incorporates high quality locally distinctive design.

Fabric condition survey, Section 9.9_ Handout 2

The **fabric condition survey** gives an indication of the condition of the building.

By identifying areas where work might be needed due to deterioration, we may be possible to identify where the fabric could be upgraded with a relatively smaller additional cost as much of the associated preliminaries, scaffolding, opening up work, and, afterward, the finishing and decoration, will have to be spent anyway. By doing this the return on investment is improved.

| Item | Location | Detail | Condition |
|------------------|---|--|--|
| Roof Structure | Main gallery and office | <ul style="list-style-type: none"> -Traditional pitched and hipped timber structure -Slated, clay ridge tile, rolled lead hip -Marginal void at apex above raised ceiling -150mm approx mineral wool insulation above ceiling level in 2nd floor office -Assumed similar throughout | <ul style="list-style-type: none"> Generally in good condition -Significant undulation to ridge of main gallery -Gaps around exposed rafter ends along south elevation -No signs of ventilation to roof - assumed through un-felted roof structure breathable felt -Felt to office roof |
| Ceiling | Main gallery | <ul style="list-style-type: none"> -Flat of ceiling raised above eaves with curved eaves detail to perimeter of gallery space -Elaborate plasterwork detailing -3no. multi-pane prism lay light with splayed panelled reveal | <ul style="list-style-type: none"> -Good condition -Recently refurbished |
| | Office and service spaces | <ul style="list-style-type: none"> -Gypsum board flat ceiling -Ceiling joists tying rafter ends | <ul style="list-style-type: none"> -Some cracking and uneven in places -Gaps between insulation lengths -Ceiling joists uncovered by insulation |
| Walls (exterior) | Main gallery (north and west elevation) | <ul style="list-style-type: none"> -Ashlar stone with small areas of light weathering to string detail and lower plinth up to cill height (west elevation). | <ul style="list-style-type: none"> -Good -Light moss growth at lower plinth level |

| Item | Location | Detail | Condition |
|------------------|---|---|--|
| | Office and service spaces (east and south elevations) | -550mm thick, coursed stone -Various stone infills to previous window openings to rear elevation | -Poor re-pointing with cement mortar -Some stones with degraded faces due to extensive weathering - Cracking to joint between gallery and adjacent, structure to rear elevation -Cracks to various stone lintels and cills to rear and east elevation |
| Walls (interior) | Main gallery | -Plaster finish with decorative detailing | -Good -Recently refurbished |
| | Offices (ground and 1st floor) | -Modern gypsum plaster lining at ground level -Some plaster parging | -Poor condition at first floor -Some gaps and cracks |
| | Basement | -Exposed stone walls with infill of stone and engineering brick. -Inappropriate cement mortar pointing. -Damp proof membrane lapped up and chased into wall at low level – visible along north corridor | - Dampness to walls, efflorescence and deterioration of masonry -Small amounts of black mould growth |
| Floors | Main gallery | - Modern concrete floor -Timber board surfacing -Ventilation grills into basement corridor | -Good condition |
| | Basement | -Exposed cast concrete with DPM | -Good condition -No sign of insulation, but assumed to be installed to meet regulations |
| Windows | Main gallery (north and west elevations) | - Windows central timber mullion, arched top light -All originally fixed lights -Some smaller opening casements inserted -All timber frames with clear single glazing panes -No ventilation integrated into windows -Single glazed secondary | -Generally sound condition -Some cracking and peeling of paintwork to bottom rail of window frames and cills -Signs of previous repairs to sections of frame |

| Item | Location | Detail | Condition |
|-----------------------|---|---|--|
| | | glazing installed -Internal blinds constantly drawn shut -Skylights to main gallery hall artificially lit | |
| | Office and service spaces (east and south elevations) | -Various window styles -All timber frames with single glazing -No ventilation integrated into windows -Single glazed secondary glazing | - deterioration of window frames, glazing bars and seals -Peeling paint -No draught stripping -Difficult with operation of some secondary glazing units and windows |
| | | | |
| External doors | Main gallery space (entrance) | -Solid, raised and fielded, timber panel doors with timber side panels -Single pane arched fanlight (assumed to be single glazing) -Painted finish -Internal vestibule | -Generally in sound condition -Main front entrance continually open during visiting hours with inner vestibule doors also held open -Draught stripping of all doors undetermined |
| Above ground drainage | Main gallery (north and west elevations) | -Lead or cast-iron downpipes and hoppers -Hidden gutters behind stone parapet -French drain along north elevation | -In good condition -Hidden gutters assumed to be in good condition -Poor drainage to French drain |
| | Office and service spaces | -Half round gutters on brackets | -Small amount of vegetation growth to gutters -Irregular gradient to gutter falls |

Feasible carbon saving interventions , Section 9.9_ Handout 3

The analysis of feasible carbon saving interventions assesses the likely impact upon of alternative actions upon the significance of the heritage asset. All historic buildings in use need to evolve to a lesser or greater degree to respond to that use in the manner of the day – and with some anticipation of the future. Conservation Officers need to balance the advantages of greater efficiency and sustainability against the degree of impact this might have upon its historic significance. (Hence the need for Conservation Plans for major historic buildings)

| No | Intervention | Description | Heritage Impact |
|-------------------------|---|--|-----------------|
| Behaviour change | | | |
| 1 | Energy consumption targets/monitoring/ metering | Establish clear and accurate benchmarks of current consumption. Set realistic targets and monitor performance against targets by reading meters, including sub-meters as included below. Key carbon reduction tools. | None |
| 2 | Formal staff/building users feedback mechanisms | Establish robust and continuing procedures to use occupiers experience effectively. | None |
| 3 | Sustainability brief for staff | Set out and explain the reasons and approach to sustainability. What does it mean for the individual? | None |
| 4 | Develop building user/ manager training program | Ongoing training is important including new starters and refresher courses. Strong and clear leadership should be at the root of this. | None |
| 5 | Building users' guides, up to date, comprehensive, accessible Operation & Maintenance manuals | Occupiers and facilities managers cannot be expected to use and operate buildings without clear information appropriate to their level of involvement. | None |
| 6 | Energy efficient appliance selection | When fridges and kettles are due for replacement select AAA rated appliances. Item | None |

| No | Intervention | Description | Heritage Impact |
|------------------------|-------------------------|---|---|
| | | 16 includes a new dishwasher. | |
| Building fabric | | | |
| 7 | Upgrade wall insulation | Insulate the internal face of external walls where practicable in all areas apart from the main gallery. Scarify approximately 400 m ² of existing painted walls to increase moisture permeability. In historic areas remove and set aside skirting's and architraves for reinstatement. Line walls with a layer of natural, breathable insulation (e.g. 75mm of wood fibre board or hemp batts) with suitable detailing to mitigate cold bridging. Apply a lime or clay plaster and natural paint finish. | This will mainly affect areas of medium significance in the offices, where relationships between openings and walls can be managed by careful design. Early discussion with local planning authority is recommended but the benefits of the proposals are considered to justify the internal alterations. In the north gallery, decorative details such as plaster cornices and architraves would be compromised by wall linings, and the impact on significance will be greater. |
| 8 | Upgrade roof insulation | Add a further 150mm of mineral wool insulation and resolve local shortfalls. Insulate the space above the lay lights to achieve a similar standard. | None. |
| 9 | Install draught strips | Install proprietary draught strips to all internal and external doors. | Draught strips are unlikely to affect significance, but a new draught lobby will affect spatial and architectural character of the main hall and reduce floor area of the gallery. The benefits justify this which can be mitigated by careful design. Early discussion with local planning authority essential. |

| No | Intervention | Description | Heritage Impact |
|--------------------------|--|---|---|
| Building services | | | |
| 10 | Occupancy sensors for lighting | In the office and ancillary areas only to enable automatic shutdown of lighting when spaces are unoccupied. | None |
| 11 | Energy efficient light fittings, LED lighting | Replace existing low efficiency light fittings with modern low energy equivalents such as compact fluorescent, T5 high frequency fluorescent and specialist LED display lighting. | None |
| 12 | Electrical sub-metering to all key installations | This should cover lighting, small power, machinery, plant. This facility is vital to understand how much power is being used by different services installations. | None |
| 13 | Time switches or similar on small equipment | A low cost means of guaranteeing equipment shut down when not in use. | None |
| 14 | Photovoltaics (PV) with Feed-In Tariff | Photovoltaic solar electricity panels installed on the south facing roof slope on the secondary elevation. This does not appear to be significantly overlooked but viewpoints should be reviewed with the conservation officer. | The south slope of this large roof is hidden in most views from the public realm as this side of other building overlooks a rear yard area. Viewpoints should be assessed to consider the impact and the integrity of the roof and slates should be addressed as part of the design and installation. |
| 15 | New domestic hot water system and dishwasher | Localised, on demand electric water heaters to basins and sinks. New AAA rated dishwasher with cold feed. | None |

| No | Intervention | Description | Heritage Impact |
|----|--|---|-----------------|
| 16 | Modify temperature set points | 19-20°C to offices and gallery. Consider background only conservation heating to gallery space for greater savings. Staff may need to wear warmer clothing during cold weather. | None |
| 17 | Ensure controls are working correctly | Initial review to maximise the benefit and efficiency of existing systems. Ensure that testing is embedded in maintenance regime. | None |
| 18 | Introduce demand controlled ventilation | Install three new replacement fans to offices with local timed controls. | None |
| 19 | Install digital control system for all major plant | Digital building management system with boiler optimum start, automatic trend logging, alarm handling, monitoring and other aids to efficient operation. | None |
| 20 | Upgrade boiler system and pumps | Two replacement, high efficiency gas condensing boilers with high efficiency pumps. | None |

Low and zero carbon technologies

The low and zero carbon technologies table examines all the potential alternative mechanical engineering techniques, active and passive, that could reduce carbon energy usage and their potential applicability to the building under examination. It is not a case of implementing as many technologies as possible as the pay back becomes less effective the more actions are compounded

| LZC Technology and Low Energy options | Approximate capital cost | Cost per 1% CO ₂ reduction over base building | Operational cost | Future energy costs | Simple payback (without Feed in Tariff/RHI) | Noise impact | Planning implications | Funding/ Grants | Applicability to Mercer Gallery | Technical issues/ any other criteria |
|---|--------------------------|--|------------------|---------------------|---|---|--|-----------------|---------------------------------|--|
| Solar Hot Water Panels | Moderate | Moderate to High | Low | Low | Moderate | None | Roof loading and less sensitive elevation | RHI | ✘ | Solar Hot Water limited by low hot water demand. Effective with a centralised hot water system. |
| Photovoltaic | Very High | Very High | Low | Low | High | None | Roof loading and less sensitive elevation | FIT | ✔ | Limitation on size of roof area available and possible sensitivity of views from overlooking areas. |
| Gas Fired District Heating CHP | Moderate | Moderate | Moderate | High | Moderate to High | Moderate | Flue height | | ✘ | Cost effectiveness to be balanced with carbon reduction requirements. Minimum operation hours 4000 to 5000 required to be effective. |
| Biofuel CHP | Moderate to High | Moderate | Moderate to High | High | Moderate to High | Moderate | Flue height | | ✘ | Reliability of fuel supply, concern over sourcing of fuel product. |
| Biomass CHP | Very High | Moderate | Very High | Low | High | Moderate | Flue height, pollution levels and plantroom size | RHI | ✘ | Limited number of successful installations. Restricted plant room/ fuel store area, delivery access problematic, planning issues - flue height and NOx levels to address, maintenance costs. |
| Wind Turbines | Moderate | Moderate | Low | Low | High | Moderate to High | Planning application required | FIT | ✘ | Not appropriate for city centre locations. Planning implication and output/effectiveness dependent on site specific wind speed. |
| Off Site Wind Generation | High | Low | Low to moderate | Low | Moderate | High | Planning application required | FIT | ✘ | Technology acceptable only with direct link to building as off-site turbines are located remote from buildings. Note visual impact in conservation areas etc. |
| Biomass Boilers | High | Moderate | High | Low | Low to Moderate | Low (note noise from delivery vehicles) | Flue height, pollution levels and plantroom size | RHI | ✘ | Plant room/fuel store area, delivery access, planning issues - flue height, NOx levels, maintenance costs. |
| Ground Source Heat Pumps | High | Very High | Moderate | Moderate | High | Low | Archaeological impact to be assessed | RHI | ✘ | Output depends on ground conditions. Limited application of low grade heat produced GSHP means the system is unsuitable for listed building with limited opportunity for fabric improvements to reduce heating demand. |
| Air Source Heat Pumps | Moderate | Moderate | Moderate | Moderate | Moderate | Moderate | Moderate | RHI | ✘ | Noise/plant location, efficiency in winter operation, low grade heat produced by ASHP |
| Open Loop water source heat pump | High | High | Moderate | Moderate | High | Low to medium | Application to Environment Agency | RHI | ✘ | Investigation required to establish if local water body available for operation of water source heat pump |
| Exposed Thermal Mass | Low | Low | Low | Low | Low | Low | None | | ✔ | Required for natural ventilation systems. Delays peak room temperature reducing risk of overheating in occupied hours. |
| Passivhaus | High | Moderate | Low | Low | Low | Low | Historic character of building | | ✘ | Low U-values required for walls & glazing not achievable on historic buildings without affecting character of building. |
| Maximisation of daylight, daylight controls, automatic lighting controls & energy efficiency lighting | Low to Moderate | Low | Low | Low | Low | Low | None | | ✔ | Energy efficient lighting and controls can be implemented. |
| Earth Tubes | Moderate | Moderate | Low | Low | Moderate | Low | None | | ✘ | Disruptive to existing listed buildings. Require space for installation and adoption of mechanical ventilation strategy |

Options appraisal, Section 9.9_ Handout 5

The options appraisal is a to assist those assessing the relative impact of different measures that might be taken. The key is to adopt the fewest interventions - those with the minimum heritage impact and the maximum carbon saving and payback.

| Ref. | Intervention | Level | Capital cost £ | Electricity saving % | Gas saving % | Gas & electricity savings £ pa | Simple payback Years | Carbon saved tCO ₂ | Heritage impact |
|-------------------------|---|----------|-------------------|-------------------------|-----------------|-----------------------------------|-------------------------|----------------------------------|-----------------|
| Behaviour change | | | | | | | | | |
| 1 | Energy consumption targets/ monitoring/ metering | Easy win | 100 | 2.0% | 5.0% | 326 | 0.3 | 1.58 | None |
| 2 | Formal staff/ building users feedback mechanisms | Easy win | 100 | 0.5% | 0.5% | 51 | 2.0 | 0.31 | None |
| 3 | Sustainability brief for staff | Easy win | 100 | 0.5% | 0.5% | 51 | 2.0 | 0.31 | None |
| 4 | Develop building user/manager training program | Easy win | 100 | 2.5% | 5.0% | 356 | 0.3 | 2.34 | None |
| 5 | Building users' guides, full accessible O&M manuals | Easy win | 100 | 0.5% | 0.5% | 51 | 2.0 | 0.31 | None |
| 6 | Energy efficient appliance selection | Easy win | 100 | 0.5% | 0.0% | 30 | 3.3 | 0.15 | None |
| Building fabric | | | | | | | | | |
| 7 | Install wall insulation | Major | 12,000 | 0% | 15% | 620 | 19.4 | 4.75 | Manageable |
| 8 | Upgrade roof insulation | Cyclical | 2,900 | 0% | 7.5% | 310 | 9.4 | 2.38 | None |
| 9 | Install draught strips to windows and doors | Easy win | 800 | 0% | 4% | 165 | 4.8 | 1.27 | Manageable |

| Ref. | Intervention | Level | Capital cost £ | Electricity saving % | Gas saving % | Gas & electricity savings £ pa | Simple payback Years | Carbon saved tCO ₂ | Heritage impact |
|--------------------------|--|----------|-------------------|-------------------------|-----------------|-----------------------------------|-------------------------|----------------------------------|-----------------|
| Building services | | | | | | | | | |
| 10 | Occupancy sensors for lighting | Cyclical | 800 | 0.5% | 0% | 30 | 26.7 | 0.15 | None |
| 11 | Energy efficient light fittings, LED lighting | Cyclical | 7,500 | 12% | 0% | 720 | 10.4 | 3.64 | None |
| 12 | Electrical sub-metering to all key installations | Easy win | 2,800 | 5% | 0% | 300 | 9.3 | 1.52 | None |
| 13 | Time switches or similar on small equipment | Easy win | 200 | 0.5% | 0% | 30 | 6.7 | 0.15 | None |
| 14 | Photovoltaics (PV) with Feed-In Tariff | Major | 21,800 | 9% | 0% | 2,333 | 9.3 | 2.73 | Manageable |
| 15 | New domestic hot water system and dishwasher | Cyclical | 2,500 | 10% | 0% | 601 | 4.2 | 3.03 | None |
| 16 | Modify temperature set points | Easy win | 100 | 1% | 5% | 266 | 0.4 | 1.89 | None |
| 17 | Ensure controls are working correctly | Easy win | 1,000 | 1% | 2% | 143 | 7.0 | 0.94 | None |
| 18 | Introduce demand controlled ventilation | Cyclical | 800 | 0.5% | 0.5% | 51 | 15.8 | 0.31 | None |
| 19 | Install digital control system for all major plant | Cyclical | 10,000 | 2% | 5% | 326 | 30.6 | 2.19 | None |
| 20 | Upgrade boiler system and pumps | Cyclical | 13,000 | 0.5% | 10% | 443 | 29.3 | 3.32 | None |