Contacts

Contacts

Westminster City Council
www.westminster.gov.uk 020 7641 6000

Westminster Planning department
General Enquiries 020 7641 2653
Central Team 020 7641 2514
North Westminster 020 7641 2338
(for NW1, NW8, W2 W9, W10, W11)
South Westminster 020 7641 2681
(for SW1, SW7, WC2, EC4)

Westminster Building Control
North Westminster 020 7641 7240
South Westminster 020 7641 7230

Westminster Environmental Health Service
Advice: Housing Standards 020 7641 1145
General Enquiries 020 7641 6161

Westminster Housing Advice
Advice & Assessment Centre 020 7641 1000
Private Sector & Energy Officer 020 7641 2583

Energy Efficiency Advice Centre
0800 512 012

Association for Environment-Conscious Building
01559 370908 www.aecb.net

Association of Community Technical Aid Centres
www.liv.ac.uk/abe/actac/

Building Research Establishment (BRE)
01923 664000 www.bre.co.uk

BREEAM EcoHomes
01923 664462 www.bre.co.uk

English Heritage
0870 333 1181 www.english-heritage.org.uk

English Nature
01733 455101 www.english-nature.org.uk

Environment Agency
0845 933 3111 www.environment-agency.gov.uk

Forest Stewardship Council (FSC)
01686 419916 www.fsc-uk.demon.co.uk

Society for the Protection of Ancient Buildings (SPAB)
020 7377 1644 www.spab.org.uk

Publications

The following publications can be obtained by contacting the following organisations as above

City of Westminster
Obtain from One Stop Services, City Hall or the Planning Department.
Sustainable Buildings in Westminster:
Supplementary Planning Guidance
The Planning Application Process
Planning Applications Advice.

SPAB
Technical Pamphlets -
TP/8 The Control of Damp in Old Buildings
TP/9 Electrical Installations
TP/13 Repair of Wood Windows
TP/15 Care and Repair of Old Floors
Information sheets -
IN/4 The Need for Old Buildings to “Breathe”
IN/9 An Introduction to Building Limes
IN/13 Is Timber Treatment Always Necessary?

BRE
Good Practice Guide 139 -
Draughtstripping of existing doors and windows
Good Practice Guide 155 -
Energy efficient refurbishment of existing housing
Good Practice Guide 171 -
Energy efficiency primer
Good Practice Guide 224 -
Improving air tightness in existing homes
Refurbishment site guide for solid-walled houses series:
Good Practice Guide 294 - ground floors
Good Practice Guide 295 - windows and doors
Good Practice Guide 296 - roofs
Good Practice Guide 297 - walls
General Information Leaflet 59 -
Central Heating System Specifications (CHeSS)

Acknowledgments
We would like to thank the National Trust, English Heritage & the Society for the Protection of Ancient Buildings
This guide was researched, written by Gale & Snowden Architects - www.ecodesign.co.uk

Energy Efficiency in Conservation Areas

City of Westminster

A general guide to upgrading the energy efficiency of residential accommodation within City of Westminster Conservation Areas

- An integrated approach to energy efficiency
- Guidance on Planning issues and energy efficiency
- Simple and cost effective design solutions
- Water conservation
- Choosing materials
- Contacts and references

Upgrading the energy efficiency of buildings in Conservation Areas

Contents

Planning Definitions

Conservation Areas

These are defined by the Civic Amenities Act 1967 as 'areas of special architectural and historic interest, the character and appearance of which it is desirable to preserve or enhance'. Other legislation gives protection to individual listed buildings of specific architectural or historic interest. The City of Westminster will confirm if a building is located in a Conservation Area and the Planning Department will provide guidance on any proposed alterations and requirements for Planning consent.

Article 4 Directions

This legislation may impose additional restrictions on the treatment of facades and conservation areas, for example in Queen's Park.

Listed Buildings

This leaflet does not provide guidance for renovation or upgrading of Listed Buildings. Works other than routine maintenance will require Listed Building Consent in addition to any other consent. For all Listed Building enquiries please contact The City of Westminster Planning Department.

Energy Efficiency in Conservation Areas

Key Advice

- Do not alter the external appearance of buildings in Conservation Areas without consent from the City of Westminster
- Always repair where possible and replace with like for like
- Insulate existing buildings as much as possible to retain heat
- Upgrade windows and doors sympathetically
- Draught-proof buildings to prevent unwanted air leakage and heat loss
- Ensure adequately controlled ventilation is provided
- Upgrade the heating system to a gas condensing boiler and install user-friendly controls
- Ensure adequate daylight is provided to all habitable rooms
- Install high frequency fluorescent artificial lighting, with automatic controls if appropriate
- Provide energy and water efficient domestic appliances with 'A' ratings
- Include water saving fittings and appliances
- Carry out an energy advice programme to ensure effective use of energy & water efficiency features
- Consider other environmental issues such as sources of materials, prevention of pollution and healthy internal environments
- If in doubt about any issues seek assistance from The City of Westminster contacts overleaf
- Listed Buildings have additional protective legislation so consult with the City of Westminster Planning Department for all proposed alterations
- Ensure all works meet building control standards. Contact City of Westminster Building Control department for further advice.

Glossary

breathing	a characteristic of traditional and natural materials explained further on page 15
dew-point	where internal moisture condenses in colder parts of a construction causing damp
draught lobby	unheated space at the end of a hall with two draught-proofed doors to the outside
DPC	damp-proof course - an impermeable material that prevents the passage of moisture
DPM	damp-proof membrane - an impermeable waterproof sheet
EMF	electro-magnetic fields from power sources
LSA	Lead Sheet Association for technical manuals see www.leadsheetassociation.org.uk
LSF	non-pvc electric cabling - 'low smoke and fume'
NOx	nitrous oxides produced by the combustion of fossil fuels.
ODP	ozone depletion potential of a material - chlorofrlourocarbons (CFCs) have high ODP
OHLS	non-pvc electric cabling - 'zero halogen low smoke'
PVC	polyvinyl chloride - chlorine produced in manufacture can be extremely polluting
sarking	waterproof roofing membrane which can be vapour permeable
SEDBUK	Seasonal Efficiency of Domestic Boilers in the UK (www.sedbuk.com)
Sunpipes	transfer daylight down a reflective tube, usually from a roof to a lower ceiling
VOC	volatile organic compound - such as formaldehyde, a suspected carcinogen
RSL	Registered Social Landlord

Examples of good practice

Historic building refurbishment

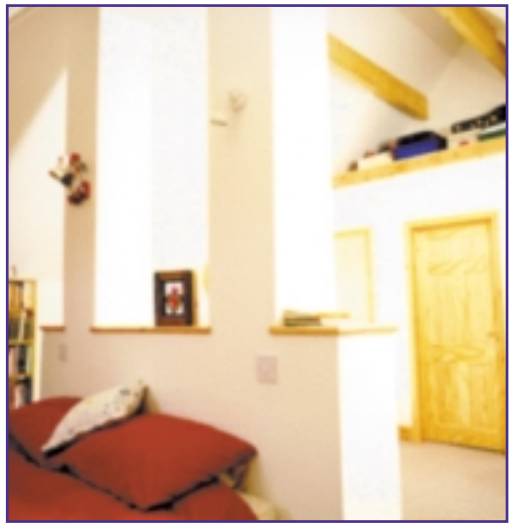
- Original windows restored with original timber shutters
- Internal insulated dry-lining added to all external walls
- Original plaster covings, architraves, skirtings and niches reproduced or reused where possible
- Timber floors recycled from other parts of the building
- TRVs on all radiators run from a gas condensing boiler with an energy efficient zoned management system

Room-in-the-roof

- Good daylighting from a rooflight on non-principal elevation. This reduces the need for artificial light
- 300mm of cellulose insulation used in combination with vapour-permeable sarking, avoiding the need for a continuous ventilation gap under it (see page 5)
- Natural flooring, paints and wood finishes make this a healthy living space with low toxicity

Secondary glazing to original windows

- Original double-hung sash window restored
- Secondary glazing divided in line with central mullion
- Traditional timber construction and brass ironmongery
- Double glaze the secondary glazing to improve efficiency
- Draught-stripping is incorporated into the frame (see page 7)



Energy Efficiency in Conservation Areas

Introduction

Energy Efficiency

This publication is intended to provide guidance on improving energy efficiency when renovating or upgrading existing buildings in Conservation Areas.

This leaflet provides general guidance and indicates good practice.

Further guidance on Conservation Areas can be found in a range of City of Westminster publications and Supplementary Planning Guidance (SPG) (see www.westminster.gov.uk).

The wholesale refurbishment of existing buildings provides an opportunity to significantly improve energy efficiency, an opportunity perhaps that may not reoccur for another 30 years. Energy efficiency in buildings is of great importance as it:

- reduces consumption of finite fossil fuel resources;
- reduces CO_2 emissions and the effects of global warming;
- reduces occupants' fuel bills and improves their comfort.

The City of Westminster supports and encourages the upgrading of existing building stock to improve energy efficiency. Work to buildings in Conservation Areas needs to be designed and carried out with great care to avoid detrimental effects to the visual appearance, performance and character of the area.
There are many improvements that can be undertaken sympathetically. The Planning department will provide guidance on alterations that can have varying implications for historic buildings.

Holistic Approach

Energy efficiency is most effectively achieved when an integrated approach is taken to all aspects of a building's performance. For instance, it would not be very effective to carry out insulation without having considered draught-proofing, as much of the retained heat would be lost through uncontrolled ventilation.

Therefore this leaflet covers a wide range of energy efficiency issues:

- insulation of floors, walls and roofs;
- draught-proofing to reduce unwanted heat loss;
- ventilation control by natural & mechanical means;
- window & door improvements for insulation and draught-proofing;
- heating replacement and improved controls;
- lighting & electrical energy saving.

In addition, when improvements are carried out within an overall environmental approach, there are a number of other significant benefits for the:

- care of historic buildings;
- health of occupants;
- prevention of pollution.

This can be achieved by:

- use of traditional 'breathing' materials compatible with historic buildings e.g. lime products
- careful choice of materials that are non-toxic to human health e.g. organic paints and stains;
- specification of products that do not cause significant pollution in their production e.g. non-PVC;
- specification of low NOx boilers, NOx being the main contributor to acid rain.

Saving water brings further environmental benefits and cost savings and is discussed, together with the choice of materials on pages 13-16.

Insulation

Key Principles

Insulating a building envelope is essential to improve energy efficiency. Adding or increasing insulation to floors, walls, roofs and increasing the thermal performance of windows and doors (see pages 9 & 10) can be achieved in various ways. The choice of technique will depend on the construction of the building, on cost limits and on planning restrictions.

When installing insulation the following key principles should be followed to ensure Good Practice, to achieve maximum energy efficiency and cost effectiveness:

- Carry out insulation as part of an integrated energy efficiency refurbishment strategy;
- Use as much insulation as possible - generally the benefits increase with insulation depth;
- Ensure by dew-point calculation that interstitial condensation will not occur within the construction;
- Ensure that the insulation is continuous particularly at floor, wall and roof junctions so that thermal bridging does not occur (see page 5);
- Ensure that the method of insulation does not cause or aggravate rot or dampness problems;
- Use insulation with Zero Ozone Depletion Potential (ZODP) to prevent contributing to global warming.

Ground Floors & Basements

Ground floors are responsible for a significant amount of heat loss, up to 10%, so insulation should be considered during refurbishment work. Planning guidance is given on page 6.

Raising floors is undesirable where it disturbs original features such as stone or tiling, or involves altering existing doors, staircases and lift access. However, some methods allow original floors and levels to be maintained or rebuilt. Alternatively, external perimeter trench insulation can be used.

Solid floor insulation

- is normally cost effective if replacing a floor or existing screen, which avoids raising floor levels
- can be placed under the slab if replacing a floor, which allows a solid floor finish to be built
- can be placed above the slab, topped by boards, in place of an existing screen (see above)
- needs technical advice if working with original floors e.g. stone, earth or lime concrete

Suspended floor insulation

- normally easy & worthwhile if access available from below, or if renewing floorboards (see left)
- raises floor levels when added on top of existing timber floors with battens and new boards
- needs draughtstripping between floor, skirtings & panelling with ventilation to voids underneath
- should use open jointed boards or netting to support insulation and avoid trapping spilt liquids

Energy Efficiency in Conservation Areas

Materials

Insulation

All insulants should have zero ODP. Some insulants, e.g. some cavity wall insulation materials have health hazard concerns, others such as mineral fibre, use large amounts of energy in their production: up to 30 times that of sheep wool. Other natural materials such as hemp and flax are available and cork (see top right) is also appropriate for use in flat roofing. Recycled cellulose insulation (see middle right) can be used in roofs and suspended floors.

PVC-free buildings

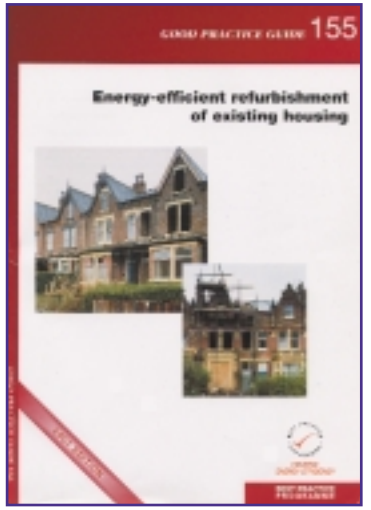
There are significant concerns about the sustainability of PVC products in terms of pollutants, longevity, maintainability and disposal. It is possible to produce sustainable PVC-free buildings, with timber windows and doors, cast iron rainwater goods, LSF or OHLS cabling and clay drainage.

Transport of materials

As with labour and skills, it is important to use locally sourced materials wherever possible, to reduce the pollution arising from and the energy involved in the transport of bulky building materials.

Repair and reuse

Good design and detailing and the repair or replacement with like for like ensures that the building performance is not affected. Use recycled or reused materials wherever possible but ensure that they are sourced from a reputable supplier.



Materials & construction advice

The AECB 'Greener Building' directory is a good source book for the environmental selection of materials. ACTAC produce the 'Green Building Digest: a guide to building products and their impact on the environment'. The BRE produce various publications concerning the environmental selection of materials, such as 'The Green Guide to Specification' and produce numerous Good Practice Guides such as that opposite. See Contacts on the back page for all of the above.

Materials

Key Principles

Buildings constructed with traditional materials often have no DPCs, impervious membranes or finishes that modern buildings rely on. Moisture can be absorbed by the fabric and released again when better conditions prevail: this is often referred to as 'breathing' construction. Further detail is contained in SPAB Information Sheet 4 'The need for old buildings to breathe', see Contacts on the back page.

Poor choice of materials and improvements can have a significant impact on building performance, exacerbating damp problems and accelerating deterioration. SPAB have a number of technical pamphlets giving relevant advice. In addition, there is often a greater energy input in the form of heating, ventilation and dehumidification as a result. Damp walls do not retain heat and will increase heat loss.

It is Good Practice when renovating traditional buildings to introduce replacement materials that are similarly 'breathable'. When extending in modern materials and carrying out refurbishment works at the same time, two separate specifications are needed.

Materials can have a significant impact on the environment and the health of occupants. Before choosing a material, please consider:

- the source of its original raw materials
- manufacturing processes
- transport of resources and products
- the impact on a building and its occupants
- the issues surrounding removal and disposal

A number of subjects are discussed below in relation to the above issues.

Lime mortar

The porosity of lime and earth based mortar and renders permits evaporation of moisture from within the wall. The application of cement pointing and renders on traditional walls is largely non-porous and may lead to damp, rot and deterioration. Lime and earth based mortars are widely available, use less energy in their production and can easily be removed from buildings allowing recycling and reuse.

Timber

All timber used in building and finishing should be sustainably sourced. The Forest Stewardship Council (FSC) runs a credible certification scheme to label such timber (see Contacts). Leading campaigners advise that other certification schemes should be approached with caution. They should have objective and measurable standards, demonstrate a credible chain of custody and have a system for independent assessment or audit.

Timber products that use glues e.g. particle boards can contain VOCs which should be avoided.

Timber treatment

It is usually advisable to seek professional advice from a suitably experienced architect or surveyor before employing the services of a commercial company. In many cases, prevention by good design and maintenance is better than a cure. The unnecessary destruction of fabric and use of chemicals is often unjustified.

A number of publications are available, such as 'Timber Decay in Buildings: the conservation approach to treatment' by Brian Ridout, English Heritage & Historic Scotland in association with E & F Spon (ISBN 0 419188 20 7). English Nature should be contacted where any proposed works could put bats or wildlife at risk.

Paints & stains

Limewash was widely used to decorate buildings internally and externally. This is a porous material and is still available. Modern petrochemical paints form a barrier to moisture and exacerbate blistering, condensation and mould problems. Organic-based paints and stains are porous and are much less polluting or toxic in their manufacture, application and to the occupants of a building.

Further information on the health hazards of paints can be obtained from the London Hazards Centre (www.lhc.org.uk). Materials such as oak can be considered, which do not require paints or stains.

Energy Efficiency in Conservation Areas

Insulation

Figure 1
New concrete ground slab with insulation beneath (replacement floor to existing levels)

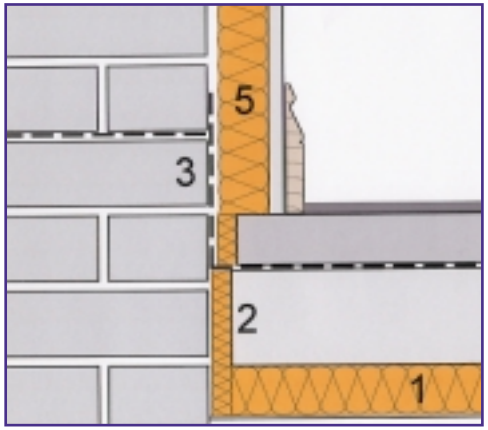


Figure 2
Concrete ground slab with insulation and boards over (replacement screen to existing levels)

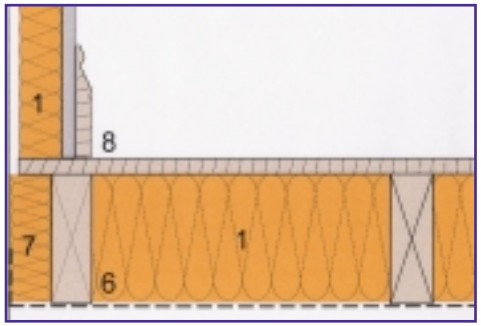


Figure 3
Suspended timber floor with access from below (existing boards and levels)

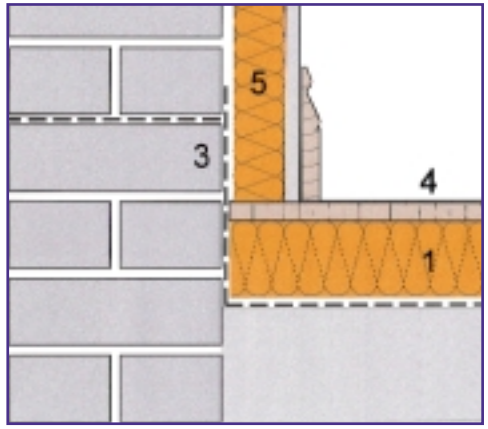
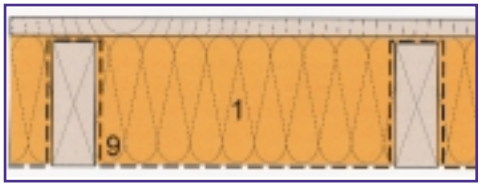


Figure 4
Suspended timber floor with access from above (replacement boards to existing levels)



Key to Figures 1- 4

1 Insulation with ZODP (flooring grade in Figs 1&2)
2 Perimeter insulation to new slab and screen
3 DPM laid to overlap DPC in wall
4 New timber boards can be supported on battens
5 Draught-sealing around internal wall insulation
6 Support netting fixed to underside of existing joists
7 Perimeter insulation to be used wherever possible
8 Draught-sealing between skirting and floor boards (particularly if no wall insulation as item 5)
9 Support netting laid over joists from above

Insulation

Roof Insulation

Roofs can be easily and cost effectively insulated. Where possible, use vapour permeable sarking to avoid the need for visible external vents. Where additional ventilation is required, ensure that external vents at eaves, ridges and down the pitch are sympathetically designed and specified.

Loft insulation

- should completely cover all ceilings below and overlap any wall insulation
- must allow good ventilation to the loft space without blocking eaves or soffit vents
- results in colder loft spaces so water tanks & pipes should be insulated or removed to avoid freezing

Room-in-the-roof insulation

- can be applied in-line with the sloping roof from inside behind a vapour check plasterboard
- usually needs a continuous ventilation gap above it
- can be added above existing timbers from outside
- should be continuous with insulation in the ceiling above and in the walls below

Flat roof insulation

- can be applied to existing roofs particularly when renewing a roof deck and finish
- needs a continuous ventilation gap to be maintained above it when laid between joists
- can be added on top of an existing deck (without ventilating below it) or underneath existing ceilings
- refer to LSA manuals for lead roofs (see glossary)

Key: Figure 5

1 Continuous line of insulation with ZODP
2 Minimum 50mm ventilation gap maintained under existing roof or vapour impermeable sarking
3 Equivalent of 25mm continuous eaves ventilation gap, with insect mesh
4 Wall and ceiling finish usually with a vapour check membrane behind

Avoiding Thermal Bridging

Thermal bridging occurs where insulation is not continuous or is bridged by materials such as masonry or timber with a higher rate of conductivity. Then heat loss increases and condensation can be a problem. It is not a planning issue and it should be carefully considered when insulating.

Care is needed particularly with internal insulation: around openings, at the junction of wall and roof insulation, and where intermediate floors and partitions meet external walls. Thermal bridging can be avoided by:

- carrying insulation around all window and door reveals up to the frames
- ensuring roof insulation reaches the top of external walls without blocking ventilation
- applying a metre of insulated dry lining to both sides of internal walls as they join external walls
- insulating in the ceiling cavity below a parapet gutter before the flat roof insulation can begin
- insulating in ceiling cavities under intermediate floors at the break in the wall insulation
- ensuring rooflights are detailed to avoid thermal bridging, including conservation products

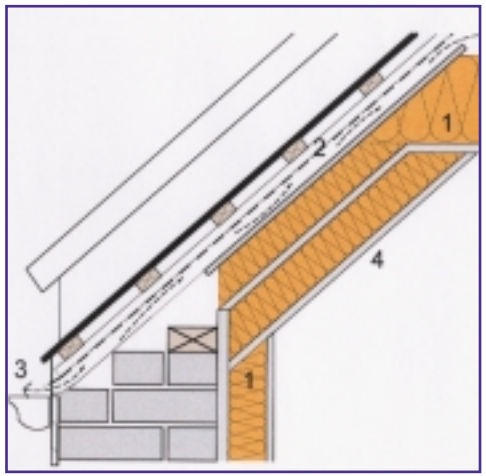


Figure 5
Typical room-in-the-roof detailing showing in-line roof insulation with loft and internal wall insulation

Energy Efficiency in Conservation Areas

A sustainable approach

Sustainability issues

All buildings, in their construction and in their use have a significant impact on the environment. Demographic trends, projected to 2016, show the number of households per head of population doubling from 1861. The current and future challenge in the maintenance and construction of all housing is to balance or reconcile its impacts with the benefits gained.

In addition to energy efficiency and water conservation, the main sustainability issues to consider when refurbishing traditional buildings include:

Use of local labour & skills

- to support local economies and the viability of local businesses
- to encourage traditional building skills and crafts using local materials
- to reduce reliance on transport leading to a reduction in energy use and pollution

Preventing pollution

- by employing energy efficiency measures
- by using products that do not contain CFC's/HCFC's, VOC's, heavy metals or PVC
- by avoiding equipment that contributes to acid rain, produces NOx or airborne particulates
- includes avoiding products from companies responsible for pollution in the developing world

Better buildings for health

- by designing correct thermal & ventilation levels
- by using non-toxic materials & components, such as organic-based paints and stains
- by avoiding VOCs - e.g. urea - formaldehyde foam insulation which has health hazard concerns
- by considering the design of domestic electrical systems to avoid Electro Magnetic Fields (EMFs)
- includes considering the health of builders

Choice of materials

The environmental selection and use of construction and finishing materials must be appropriate for traditional buildings. It is a large subject and is discussed on the next page.

Energy Advice

Whilst a building can be designed to be energy efficient, it is how the building is used that will ultimately determine how efficient a building will be. It is good practice to complement the energy efficiency improvements with an energy advice programme. This will enable occupants to:

- understand their heating & control systems
- reduce their fuel bills & budget for fuel
- alter their behaviour to save energy

RSLs are in a unique position to undertake an energy advice programme, containing for example:

- simple system-specific energy advice handbooks
- home visits by a qualified energy adviser
- energy advice surgeries for problem solving
- energy advice talks at residents' associations
- tips and advice incorporated in RSL newsletters
- a show house used as a demonstrator

Energy advice to occupants should include:

- how to use heating controls & programmers
- recommended temperature settings
- controlling condensation
- efficient use of appliances & low energy lights
- grants for energy efficiency improvements

Contractors should also be educated to give energy advice that is consistent with the above programme. Contact the Energy Efficiency Advice Centre for more information (See Contacts)

Water conservation

Mains water use

Over half the 33 billion litres of water extracted each year in the UK is used by the domestic sector. It is important to address water consumption in homes due to rising environmental concerns. Water costs can be more than the combined cost of gas and electricity in a well insulated house.

Water saving appliances can be fitted into existing buildings to make 24% to 47% savings without any impact on the external appearance. As with energy, water efficiency is determined by the activity and habits of occupants. Further advice can be sought from the Environment Agency (see contents).

Rainwater use

Rainwater collection can be considered for WC flushing, cleaning and watering to save up to 50% of household mains water consumption.

Rainwater package systems are now readily available which comprise of a centrifugal filter, storage tank, pump and controls. Tanks can be located underground or in a basement. Rainwater can be pumped to WCs directly or to a holding tank inside.

Manufacturer's instructions and water authority regulations should be followed at all times. A specialist can be consulted for further advice.

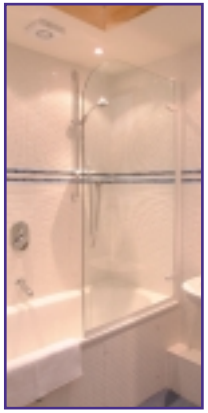
Rainwater system components - a downpipe filter (left) can be fitted easily into an existing drain system & an underground filter (right) is usually part of a new system: both filter out particles & debris

Water conservation advice

The Environment Agency's factsheets entitled 'Conserving water in buildings' provides comprehensive guidance on all aspects of water use and appliances: see Contacts on the back page.

WCs

Some WCs can use 9 litres of water a flush. Newer low flush WCs have 2 to 4 litre flushes. Waterless or vacuum toilets may only be appropriate in particular circumstances. It is sometimes possible to reduce the flush of existing WCs with a displacement or delayed fill device, though not if the WC then needs to be flushed more than once.



Baths, showers and taps

Tapered and insulated baths save water and energy.

Showers should be fitted with thermostatic mixer valves and low water use heads.

Spray taps save up to 80% of the water and energy used by standard pillar taps and aerators reduce splashing and give the illusion of greater water flow.

Energy Efficiency in Conservation Areas

Insulation

Wall Insulation

Existing walls can be insulated in a number of ways. All walls should be fully surveyed to current British Standards and deterioration corrected prior to insulating. Traditional walls have a greater ability to 'breathe' (explained on page 15), so the impact of any insulation on the overall performance of the building should be fully assessed at design stage. Planning guidance is given below.

Internal wall insulation

- is recommended for solid walls using an insulated dry lining system (usually with vapour control) which does not affect external facades
- is easy to install and can accommodate new service ducts and conduits (see right)
- avoids thermal bridging (see page 5) and interstitial condensation when correctly detailed
- can cause additional problems if any timber used is not isolated from external walls using a DPC
- improves draught-proofing of a building when sealed around its edges, see also page 7
- should be carefully detailed to avoid damaging internal features e.g. around windows & doors

Cavity fill insulation

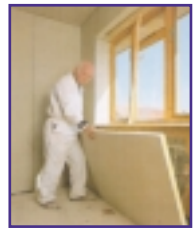
- is recommended where masonry cavities exist
- should not use materials that are a health hazard
- can damage facades during injection unless care is taken when positioning and drilling holes
- should be installed by a manufacturers' approved contractors using a tested and certified product (e.g.with a British Board of AgrÈment Certificate)

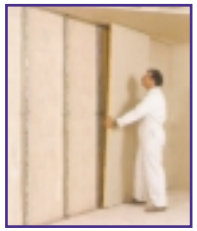
External wall insulation (EWI)

- is not preferred if existing external features and facades need to be retained
- can be used to reproduce lost original features where traditional materials cannot be used
- provides the highest insulation levels and room sizes are not reduced
- easily avoids thermal bridging and provides protection to existing walls
- makes use of thermal mass in existing walls
- should be undertaken by a manufacturer's approved contractor using a tested product with third party certification (such as BBA)

Watch points

- Prior to insulating, ensure that existing structural, damp and rot problems have been eliminated
- Never block existing ventilation holes unless an adequate ventilation method is to be provided
- Always ensure that any timber used is isolated from external construction by a DPC
- Always use non-PVC conduit, particularly next to polystyrene insulation which can react with it





Planning Guidance

Guidance should always be sought for major refurbishment works. Where there is no legislative control, good practice in the care of historic buildings should still apply. SPAB publishes such technical guidance, see Contacts on the back page.

The following general guidance is given:

- Floor and basement insulation is acceptable by following good practice for historic buildings
- Dampness and rot problems should not be treated unnecessarily with chemicals, see page 15
- Internal insulated dry lining is acceptable where internal features are not historically important
- Cavity wall insulation is acceptable provided care is taken making injection holes
- External wall insulation should only be considered in consultation with the Planning Department
- Loft insulation combined with vapour permeable sarking eliminates the need for visible roof vents
- Flat roof insulation can add thickness that should be kept below original upstands and parapets

Draughtproofing

Key Principles

Unwanted air enters and leaves buildings in many places such as through suspended timber floors and around service pipes, see Figure 6. Draught-proofing prevents significant heat loss, increases comfort levels and reduces running costs.

Old buildings rely on uncontrolled ventilation to deal with the expulsion of undesirable gases and water vapour and so draught-proofing must be carefully thought through in conjunction with the methods of ventilation to be used.

It is good practice to ensure that a new building achieves a measured amount of air tightness, done with a fan pressurisation test. This can be useful during refurbishment work to identify significant air leaks for sealing. For further information on testing contact the BRE, see Contacts on the back page.

Draught-proofing is one of the most simple and cost effective energy efficient measures for existing buildings and is rarely a planning issue where it does not affect the external appearance of a building.

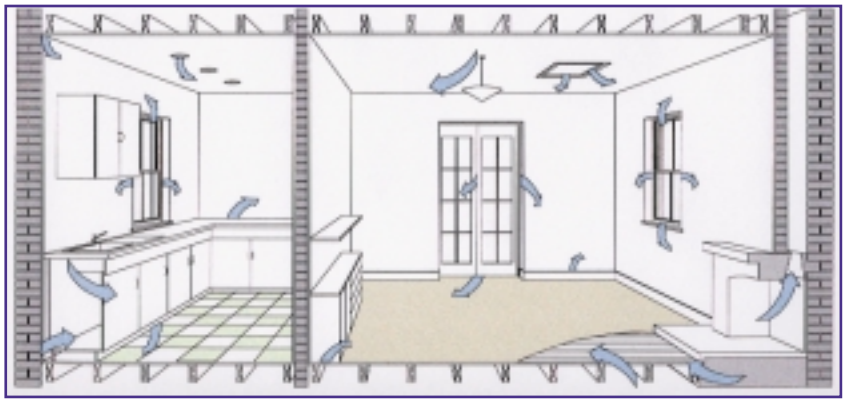
Watch points

- Do not block up air bricks and permanent ventilation to floors, roofs and sealed chimneys
- Do not block up vents for heating combustion
- Omit some draught-stripping if there are no trickle vents particularly in kitchens and bathrooms to help prevent condensation problems
- Use vapour permeable materials to allow the building to 'breathe' (see page 15)

Effective draught-proofing

- Overhaul windows and doors including draught-stripping and secondary glazing (see page 9)
- Point around window and door frames internally with sealant, externally with lime mortar
- Draught-strip and insulate the loft hatch
- Seal around internal dry lining with a continuous ribbon of plaster adhesive or a pre-compressed expanding foam strip pinned around the edges
- Seal off unused chimneys (include ventilation)
- Seal around services such as pipes and ducts passing thorough floors, walls and roofs
- Seal existing skirtings to floors (see page 3)
- Use sheet floor finishes or underlay beneath carpets and draught-excluders under doors
- Replan entrances to incorporate draught lobbies

Figure 6
Diagram showing uncontrolled air infiltration into a building which are also passages for heat loss



Energy Efficiency in Conservation Areas

Lighting & Electrical

Key Principles

Artificial lighting and domestic electrical appliances account for a large proportion of energy use in buildings. It is important to consider:

- daylight provision that cuts down energy use by artificial lighting, even in existing buildings;
- position, control and specification of energy efficient artificial lighting;
- choice of energy efficient electrical appliances.

Automatic artificial lighting controls

Presence detectors and daylight level detectors

Daylight Design

When replanning or refurbishing buildings, ensure adequate daylight is provided to all habitable rooms. Seek guidance from The City of Westminster Planning Department for any external alterations to a building in a Conservation Area The effect of daylight can be improved, giving a pleasant internal environment and reducing the need for daytime artificial lighting.

- Use light coloured floor, wall & ceiling finishes that reflect light into and around rooms.
- Borrow light from other rooms and corridors with sensitively designed internal glazing in doors or partitions (see Watch points).
- Install rooflights on non-principal elevations with approval from the Planning Department.
  Consider 'Conservation' rooflights fitted 'in-line' or flush with the roof finish (see Watch points).
- Install 'Sunpipes' from roofs on non - principal elevations. Ensure these are acceptable to the Planning Department.

Artificial Lighting

Energy efficient artificial lighting relies on following these guidelines:

- Design and position lighting that is appropriate for the use of the room;
- Concentrate lighting at task areas rather than trying to achieve an overall light level in the whole room;
- Zone lighting so that badly day lit room areas can be lit separately from the whole room;
- 'High Frequency' fluorescent light fittings reduce energy use, maintenance and electricity costs;
- Specify energy saving controls - consider using PIR (passive infra-red) presence sensors with automatic 'off' switches for shared areas;
- Install fittings with built-in ballasts that will only accept compact fluorescent lamps.

Electrical Appliances

Energy efficient and environmental specification of electrical appliances should include:

- White Goods with 'A' ratings;
- CFC/HCFC free refrigerants;
- larder fridges (with no freezer compartment);
- separate freezers;
- 'load intelligent' washing machines & dishwashers;
- gas for cooking;
- combination microwave ovens.

If appliances are not provided in the refurbishment works, then provide occupants with sufficient information on the above to make their own choices.

Watch points

- Only use double glazed 'Conservation' rooflights with thermally broken frames & integral draught-stripping and prevent thermal bridging at reveals.
- Check with Building Control regarding fire protection of internal glazing for borrowed light.
- Do not use glazing if it damages original features.
- Make sure that energy efficient external lighting is also specified.
- Dispose carefully of all old electrical appliances - they may be able to be recycled or re-conditioned.

Heating & Hot water

Key Principles

Upgrading the heating system of a building can be the most effective energy efficiency measure that can be undertaken.

Efficient and well controlled equipment must be used. Systems should be designed to avoid visible external services and minimise internal impact. The many benefits include:

- reducing fuel bills;
- reducing CO_2 emissions;
- reducing NOx emissions;
- improving occupant comfort and user control.

These benefits increase with the number of associated energy efficiency measures undertaken e.g. insulation and/or draught-proofing. It is important that heating is considered in an integrated approach to refurbishment and the full impact on the building's performance, e.g. on its ability to deal with damp and moisture, is considered.

2-channel programmers

Central heating systems should have easy to access, user-friendly controls with separate programmable on/off and boost controls for heating and hot water. Energy advice to occupants (see page 14) should include how best to operate them.

Boilers and Controls

By far the most common solution to providing domestic heating and hot water is gas central heating. Specification of the system should follow Energy Efficiency Best Practice guidelines:

- Use a condensing boiler with an A or B rating listed in SEDBUK database www.sedbuk.com;
- Use a fast recovery hot water cylinder or a condensing combination boiler;
- Specify a 2-channel programmer, a room thermostat, cylinder thermostat and TRVs on all radiators except those adjacent to a room thermostat.

These additional guidelines are also important:

- Use condensing boilers that produce the lowest levels of NOx emissions: below 70 mg/kWh;
- Lag all primary pipe work runs and hot water storage with at least 50mm of ZODP insulation;
- Use softeners to prevent build-up of limescale and ensure efficient running of equipment;
- Provide full operating manuals and full user instruction on the controls (see page 14);
- Keep pipe runs to a minimum to avoid heat loss, otherwise consider direct point of use boilers;
- Make use of wire-less technology that reduces the need for wiring through historic interiors;
- Combination boilers avoid the need for hot and cold water tanks and associated plumbing;
- Run condensate drains internally;
- Use a registered insurance-backed Corgi gas system installer (or equivalent for other fuels).

Planning Guidance

This guidance is aimed at the protection of the fabric and external character of a building. Flues, terminals and obtrusions need to be carefully handled outside and inside buildings in Conservation Areas.

- Any obtrusions on the facades of a building may require Planning consent
- Consider vertical flues that can run inside to the roof: condensing boilers can have 6 -11m flues.
- Take great care with the detail design of internal service runs to not damage original features.

Energy Efficiency in Conservation Areas

Ventilation

Key Principles

Controlled ventilation is essential for energy efficiency and to maintain air quality for a healthy building, which should be designed to:

- avoid excessive heat loss and high energy bills
- prevent build up of condensation and dampness leading to mould growth
- help deal with solar gain and build-up of heat

A ventilation strategy is vitally important when undertaking draught-proofing of an existing building (see opposite). Passive ventilation can be introduced sympathetically into historic buildings, otherwise low-energy mechanical ventilation should be optically controlled with timers and humidistats.

Planning Guidance

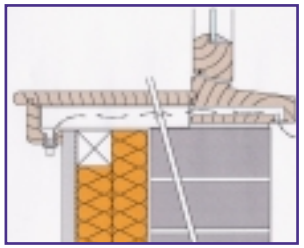
- All ducts should be accommodated internally
- External vents in walls or roofs should be designed and located to have least visual impact. Proprietary products are not always appropriate

Figure 7
Diagram showing ventilation of a house using window ventilation and passive stacks

Window ventilation

- should be available in all rooms with properly maintained opening windows to allow user control
- should include background ventilation via trickle vents in the frames to help combat condensation
- can sympathetically incorporate trickle vents if restoring traditional windows, as below

Figure 8
Concealed cill trickle vent



Passive stack ventilation

- is a zero or low energy controllable alternative to mechanical ventilation with minimum maintenance
- requires near vertical smoothly lined ducts to run from kitchens and bathrooms to the roof
- extracts moisture by stack effect (the movement of air due to temperature difference) & wind effect
- provides a continuous level of background ventilation when used with trickle vents in windows

Local extract ventilation

- requires care when positioning external wall and roof extract terminals so as not to be unsightly
- should use low wattage mechanical fans to reduce energy use and running costs
- must be positioned close to the source of pollution or moisture and away from incoming fresh air

Mechanical ventilation & heat recovery

- can have a marginal effect on overall energy consumption unless it is a very low energy system
- can have payback periods in excess of 40 years
- is most beneficial for asthma or allergy sufferers to improve indoor air quality

Windows & Doors

Key Principles

Windows, rooflights and doors are very important features of buildings in Conservation Areas. It is essential to follow the Planning Guidance opposite.

The design and production of modern windows and doors has greatly improved their energy efficiency. This has resulted in a change of character and detail not always appropriate for historic buildings - frames are thicker to incorporate multiple layers of glass and proprietary seals. There are some energy efficiency measures that are appropriate to use for historical windows, but these key principles apply:

- Increase the number of barriers to the outside using secondary glazing, shutters or heavy curtains
- Decrease the amount of air infiltration and consequent heat loss around and through frames
- Carry out thorough maintenance to ensure casements continue to fit tightly & sashes shut firmly

Improving Energy Efficiency

Traditional windows and doors are usually single glazed without draught-proofing, with a U-Value of around 5.0 W/m2K, while modern designs achieve 1.5 W/m2K and above. Modern triple glazed replacement windows may be acceptable on rear facades. The following measures retain the historical integrity of windows and doors:

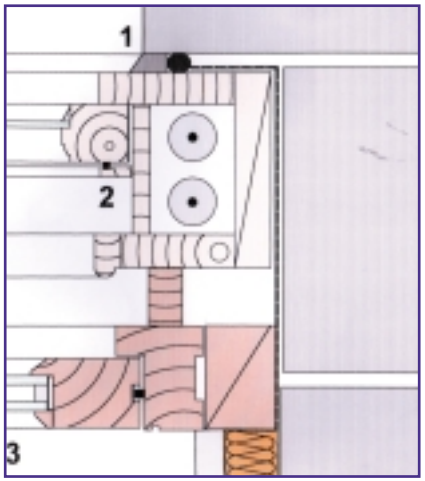
- Careful sympathetic draught-proofing measures
- Refurbishment of existing shutters or the introduction of new insulated and draught-proofed shutters
- Fitting heavy fabric curtains with a thermal lining
- Installing high performance secondary glazing
- Thorough and regular maintenance

There are associated benefits with the above:

- Reduced draughts & improved thermal comfort
- Reduced condensation on windows
- Reduced ingress of noise, dust and smoke
- Improved fitting and operation of sashes

Acceptable window refurbishment
Original windows are restored and new copies added at roof level. Any secondary glazing should line up with the restored window members

Figure 9
Secondary double glazing to an original sash window showing draught-proofing measures



Key
1. External lime mortar pointing and internal sealant
2. Proprietary draught-stripping system to sashes
3. Secondary double glazing with integral draught-stripping and a traditional timber frame

Energy Efficiency in Conservation Areas

Windows & Doors

Inappropriate modern windows degrade the Victorian character of this Queen's Park cottage.

Planning Guidance

Each window, rooflight, door and associated historical features should be considered individually and guidance on their refurbishment should be sought from The City of Westminster Planning Department.

When upgrading their energy efficiency, the following guidelines should be followed:

- It is a breach of Planning Regulations to make external alterations without Planning Consent;
- Retain and repair all original external features;
- Replace with facsimiles of the original design where the originals are missing or beyond repair;
- Use original materials - do not use PVC-u or other non-traditional materials;
- Double glazed replacement windows are usually not desirable in Conservation Areas;
- Secondary glazing divisions should line up with the existing window design.

Action	Benefits	Watch points
Draught-proofing of original doors and windows	Low cost & simple to undertake Least intrusive if done sympathetically Wide range of products for all windows Success and longevity is ensured by using quality workmanship & materials	Needs careful specification and installation Ensure draught-stripping is complete and provide adequate controlled ventilation to the room (see page 3) Different situations need different solutions
Internal insulating shutter	Low cost if refurbish existing shutters Add draught-stripping to the frames Can have other acoustic benefits	High cost if new Careful detailing & craftsmanship required Do not damage existing internal features when installing new shutters
Internal heavy curtains with thermal linings	Easily provided for relatively small additional cost Does not affect original building	Not very thermally effective due to limited draught-proofing Discomfort from draughts may remain
Internal secondary glazing	Most effective energy efficiency solution, can reduce U-values to 1.5 W/m2K Double/triple gas-filled glazed units with low-E coatings can be used with integral draught-stripping in the frames	High cost item Must ensure external appearance is not altered - see Planning Guidance above Not appropriate for some complex openings Careful detailing is always required