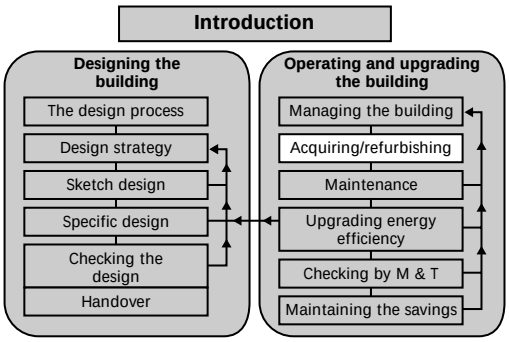
15 Acquisition and refurbishment



This section outlines the issues that need to be addressed when acquiring a new building or refurbishing an existing building (see the principles at the front of this Guide). These present major opportunities for improving energy efficiency[1,2].

15.1 Acquiring a new or existing building

Energy efficiency is seldom considered as part of the building procurement process even though purchase/rental can represent a long term commitment to high energy bills. Organisations should include energy efficiency targets in the brief to those searching for a building. Considering running costs over the building's lifetime will highlight the long-term commitment being made.

In larger and more complex buildings, it may be appropriate to carry out a brief energy audit and assessment of the potential for savings. This may highlight wasteful features that are difficult to improve in the foreseeable future, and areas in which savings can readily be made. It can also be advantageous to re-commission the building services when taking responsibility for a building in order to ensure that the design intent is being met.

Older plant may be less efficient and hence may become increasingly costly to operate and maintain. The need to replace plant should be taken into account in the procurement process, alongside any improvement in efficiency, when upgrading to new plant.

15.2 Refurbishing existing buildings

Refurbishment provides excellent opportunities for improving energy efficiency[1,2], although it can increase energy consumption where services are enhanced, e.g. by the introduction of air conditioning. Major refurbishment will involve a significant amount of design and, therefore, reference should be made to sections 2 to 13. Minor refurbishment may present opportunities for introducing the specific energy saving measures discussed in section 19.

DETR Good Practice Guide 35[3], which is supported by case studies[4,5], provides checklists that show what should be addressed in the refurbishment of offices, with appropriate benchmarks. A key decision is whether to provide air conditioning or to design it out[6], or adopt a mixed-mode approach (see section 4).

Building services installed during refurbishment should be fully commissioned before handover, and comprehensive operating and maintenance instructions should be provided (see section 13). Sub-metering of fuel supplies should also be provided as a basis for monitoring and targeting, as described under section 4.3.

15.2.1 Complete refurbishment

This generally involves total replacement of plant and major changes to the building fabric, possibly only retaining the facade or structural frame. It nearly always involves radical strategic changes to the building services, which provides major energy saving opportunities, including:

— introducing passive measures to reduce external heat gains while maximising daylight, e.g. replacing windows and introducing atria and rooflights

— changes to the ventilation strategy to minimise the use of mechanical ventilation

— assessment of the need for air-conditioning, leading to reduction and, sometimes, complete avoidance[6]

— upgrading fabric thermal performance to reduce energy requirements for heating through improved insulation and better heating controls

— installing energy efficient plant, such as condensing boilers and CHP

— installing energy efficient lighting and lighting control systems

— improving building services monitoring and controls, possibly through the introduction of BMS.

Complete refurbishment should achieve standards comparable to energy efficient new buildings[7], as discussed in 12.2.

15.2.2 Major refurbishment

This usually involves replacement of major plant and can include some changes to the fabric, e.g. window replacement. It often allows significant changes to building services strategies. Energy saving opportunities include:

— adding atria and sun spaces to increase natural ventilation and daylight[1]

— increasing the use of passive measures or mixed mode strategies in air-conditioned buildings

— maximising use of 'free' cooling

— removing (fully or partially) air conditioning through minor changes to fabric, lighting and controls, e.g. in shallow plan buildings on relatively quiet sites

— selecting efficient plant and flexible controls, including zone controls

— specifying an efficient and fully insulated hot water system, with consideration given to localised water heating where this will help to reduce standing losses.

Major refurbishment that upgrades the building envelope should enable energy use to be improved from 'typical' (medium consumption) to better than 'good practice' (i.e. low consumption), as discussed in 20.5[8].

15.2.3 Minor refurbishment

This generally involves refitting the interior and making minor alterations to space layout and plant. Energy saving opportunities include:

— changing space layout to enhance daylight, ventilation and zone controls

— improving lighting and switching arrangements, including automatic controls

— improving window performance by adding blinds etc.

— using of lighter coloured interior surfaces and furnishings to enhance the lighting efficiency

— improving perimeter services and window controls to avoid blockage by desks etc.

— introducing zoned areas for equipment etc. with high heat gains or special environmental requirements.

The aim in minor refurbishment should be to achieve 'good practice' (i.e. low consumption), as discussed in 20.5.

15.2.4 Passive refurbishment

Where possible, refurbishment should be based on passive solutions, e.g. daylighting and natural ventilation, to improve energy efficiency and reduce running costs. Passively refurbished buildings also offer potential environmental benefits[9,10] which can be used to promote the passive approach, including:

— more attractive, daylit interiors

— less dependence upon mechanical systems and ozone-depleting refrigerants.

— lower energy and maintenance costs

— good long term investment with less dependency on supplies of delivered energy

— less overheating, more comfort, and possibly a healthier internal environment

— opportunities for straightforward personal control of the local environment, particularly in cellular offices.

However, developers and investors are often worried about the marketability and financial returns from passive designs, especially for premium properties. Common concerns are:

— lower rental values; at present passive buildings enjoy no rental premium

— risks to thermal comfort, particularly if occupancy and equipment levels are high

— unfamiliar technologies may require changes of habits from management and occupants

— lack of flexibility in accommodating partitioning to suit occupiers' needs (partitions may block ventilation paths and interfere with control strategies).

Where these concerns are genuine, it helps to introduce contingency paths to allow extra services to be added easily, as necessary. For many building specifiers, wary of commitment to wholehearted passive redesign, this strategy offers a comforting 'halfway house' with an escape route[6,11,12], see 4.2.5.3.

Wherever passive measures are introduced, it is important for those who operate and occupy the building to fully understand the design and operational strategies. This will ensure that the building functions correctly in the passive mode. Otherwise, operators may assume that the measures have failed and allow extra services to be installed. Once this has occurred, it is unlikely that the building will revert to its passive mode of operation.

References

1 Buckley M (BRECSU), Burton S (ECD Partnership) and Bordass W (William Bordass Associates) *Passive refurbishment of offices, UK potential and practice Lyons, November 1994*

2 *Industrial building refurbishments: opportunities for energy efficiency* IP2/93 (Garston: Building Research Establishment)

3 *Energy efficiency in offices. Energy efficient options for refurbished offices — for the design team* GPG 35 (London: Department of Environment, Transport and Regions) (1993)

4 *Naturally comfortable offices — a refurbishment project* GPCS 308 (London: Department of Environment, Transport and Regions) (1997)

5 *Energy efficiency in offices — low cost major refurbishment. Policy Studies Institution, London* GPCS 1 (London: Department of Environment, Transport and Regions) (1989)

6 *Avoiding or minimising the use of air-conditioning — a research report from the EnREI Programme* GIR 31 (London: Department of Environment, Transport and Regions) (1995)

7 *A performance specification for the energy efficient office of the future* GIR 30 (London: Department of Environment, Transport and Regions) (1996)

8 *Introduction to energy efficiency in buildings* Booklets Energy Energy Efficiency Booklets Nos.1–13 (London: Department of Environment, Transport and Regions) (1994)

9 Halliday S P *Environmental code of practice for buildings and their services* ENCOP (Bracknell: Building Services Research and Information Association) (1994)

10 *Environmental code of practice for buildings and their services — Case studies* CS4/96 (Bracknell: Building Services Research and Information Association) (1996)

11 Jaunzens D and Bordass W T Building design for mixed mode systems *CIBSE National Conference 1995* (London: Chartered Institution of Building Services Engineers) (1995)

12 Bordass W T, Entwistle M J and Willis S T P Naturally-ventilated and mixed-mode office building: opportunities and pitfalls *CIBSE National Conference 1994* (London: Chartered Institution of Building Services Engineers) (1994)

Bibliography

Energy efficiency in refurbishment of industrial buildings. Parts warehouse GPCS 175 (London: Department of Environment, Transport and Regions) (1995)

Energy efficiency in refurbishment of industrial buildings. GEC Alsthom Large Machines Ltd., Rugby GPCS 188 (London: Department of Environment, Transport and Regions) (1995)

Booth W B and Williams R N Occupant satisfaction and environmental conditions following refurbishment of two air-conditioned office buildings to natural ventilation *CIBSE National Conference 1996* (London: Chartered Institution of Building Services Engineers) (1996)

Beggs C, Warwicker B, Winwood R, Edwards R and Bordass W T A developmental retrofit method for the utilisation of fabric thermal storage in existing buildings *CIBSE National Conference 1995* (London: Chartered Institution of Building Services Engineers) (1995)

Levermore G J *Staff reaction to building energy management systems* DLP 4 (Bracknell: Building Services Research and Information Association) (1989)