

# Checklist chart for retrofit and refurbishments

|                     |  |   |   |  |   |  |  |  |
|---------------------|--|---|---|--|---|--|--|--|
| Getting Started     | Do you know how your building uses energy?   | <b>Carry out a simple building audit/checklist:</b> <ul style="list-style-type: none"> <li>Is anyone taking responsibility for energy spend and do you know what you pay per kWh?</li> <li>What is the building's day/overnight energy consumption?</li> <li>If your building is too hot/cold, why is that?</li> <li>What appliances or systems are on when they shouldn't be?</li> <li>How well insulated is your building?</li> <li>Is your building lighting energy efficient, including in how it is controlled?</li> <li>Are your building's services optimised and well-maintained? Are the systems' filters replaced and in good working order?</li> <li>Is anyone taking responsibility for your heating programmes or controls?</li> <li>What orientation is your building? Would solar generation be possible?</li> </ul> | <b>Adopt an appropriate retrofitting standard:</b>  |  |   |  | <b>Free Or Nearly Free Things To Do</b> <ul style="list-style-type: none"> <li>Understand how energy is used in the building and make some records to show energy use patterns and baseline.</li> <li>Check what's on when it shouldn't be.</li> <li>Check if there are poorly fitted doors and windows that let cold air in.</li> <li>Check that your heating and cooling systems are serviced and optimised.</li> </ul>  | <b>Typical considerations in very inefficient buildings (DEC Rating F-G)</b> |
|                     |  |   | PAS2035/2030<br>Retrofitting dwellings  | PAS2038<br>Retrofitting non-domestic buildings for improved energy efficiency  | SKA Rating Target   | BREEAM Refurbishments Target   |  |  |
| Energy Conservation | Doors  | Walls   | Windows   | Heating  | Lighting  | Cooling  | <b>First Hit Investment, Key Points</b> <ul style="list-style-type: none"> <li>Having exhausted opportunities for improving efficiency without investment, it's time to think about direct investment to reduce energy costs, perhaps grouping opportunities to get economies of scale.</li> <li>Lower cost and complexity interventions should be considered at this stage, e.g., solar panels should probably not be the first thing you consider.</li> <li>In many cases, improving energy efficiency by investing in building fabric will be necessary before some systems interventions are even possible.</li> </ul> | <b>Typical considerations in inefficient buildings (DEC Rating E-D)</b>      |
|                     | <ul style="list-style-type: none"> <li>Ensure the doorsets are fitted well to avoid draughts. If not, ensure there is doorset draft proofing that is fitted well.</li> <li>Check for draughts coming through the floors that are sealable with fire-resistant foam or silicone.</li> </ul> | <ul style="list-style-type: none"> <li>Have a survey done to determine if the walls are solid or cavity construction, if there is insulation installed, and if there are further insulation opportunities.</li> </ul>   | <ul style="list-style-type: none"> <li>Check if any windows are being left open when the heating is on.</li> <li>Check if the windows are fitted properly. If not, check if draught proofing has been fitted well around the windows.</li> <li>Check if the blinds are being shut in summer to reduce heat gain.</li> </ul> | <ul style="list-style-type: none"> <li>Check if the heating has been programmed to be off when it's not needed and at times of low occupancy.</li> <li>Agree on a lower acceptable internal temperature with other building users.</li> </ul>          | <ul style="list-style-type: none"> <li>Check for halogen lights that have not yet been replaced with LED. Doing this can lead to a 90% saving.</li> </ul>   | <ul style="list-style-type: none"> <li>Check for any cooling systems that are being used in a way that compromises the efficiency of heating systems, or vice versa.</li> <li>If there is a single-pipe heating system, check is it adequately insulated.</li> </ul>   |  |  |
| Fabric Investment   | Doors  | Walls   | Windows   | Roof   | Floor   | <b>Advanced Investment, Key Points</b> <ul style="list-style-type: none"> <li>Now that the building is sufficiently energy efficient, consider renewing or replacing old building services.</li> <li>It may be appropriate to install submeters for more precise electricity consumption information.</li> <li>Thinking about direct utility investments could now also be economical.</li> <li>Integrating more sophisticated controls may now be appropriate, such as building management systems, to control heating and cooling linked to the outside weather</li> </ul> | <b>Typical considerations in efficient buildings (DEC Rating D-A)</b>  |  |
|                     | <ul style="list-style-type: none"> <li>Consider replacing existing doorsets with modern thermally efficient doors with insulated panels.</li> <li>Ensure that glass doors are double-glazed with Low-e glass.</li> </ul>   | <ul style="list-style-type: none"> <li>Consider filling cavity walls with insulation. Filled cavities can improve U-values from 1.8 to 0.3.</li> <li>Consider fitting insulated plasterboard to external walls with an air gap to potentially improve the U-value to 0.22.</li> <li>Understand the condensation risk in your building.</li> </ul>   | <ul style="list-style-type: none"> <li>Improve single glazing to a minimum of secondary glazing with solar film for better insulation and solar shading. Single glazing often has a U-value of 4 or worse, whilst modern double glazing's U-value is ~1.3.</li> </ul>   | <ul style="list-style-type: none"> <li>Check the levels of roof insulation and improve it to a minimum of 300mm. Lofts with 50mm of insulation can have U-values of 0.65. Fitting a further 250mm can improve the U-value to 0.13.</li> </ul>          | <ul style="list-style-type: none"> <li>Consider insulating the floors, but bear in mind it requires planning and doors may need altering. Uninsulated concrete floors have a typical U-value of 3.36. Applying just 20mm of thermal board and plywood top improves it to 0.77.</li> </ul>                     |  |  |  |
| Energy Investment   | Low Carbon Heating   | Solar Photo Voltaic (PV)  | Solar Thermal   | Mechanical Ventilation Heat Recovery   | Energy Storage  | Building Management Controls   | <b>Advanced Investment, Key Points</b> <ul style="list-style-type: none"> <li>Now that the building is sufficiently energy efficient, consider renewing or replacing old building services.</li> <li>It may be appropriate to install submeters for more precise electricity consumption information.</li> <li>Thinking about direct utility investments could now also be economical.</li> <li>Integrating more sophisticated controls may now be appropriate, such as building management systems, to control heating and cooling linked to the outside weather</li> </ul>   | <b>Typical considerations in efficient buildings (DEC Rating D-A)</b>        |
|                     | <ul style="list-style-type: none"> <li>Consider fitting air, water or ground source heat pumps. Heat pumps are vastly more energy efficient than boilers. However, do not install heat pumps in poorly insulated buildings, which will result in high operational costs.</li> </ul>        | <ul style="list-style-type: none"> <li>Evaluate opportunities for solar PV. Modern solar panels provide about 340 watts per 1.6m by 1m panel. Be aware that installations of over 3.6kW require permission from the Network Operator.</li> <li>Evaluate opportunities for electric vehicle (EV) charging infrastructure.</li> </ul>   | <ul style="list-style-type: none"> <li>Consider solar thermal, which can preheat hot water and may meet the whole requirement in the summer. Evacuated tube systems are the most efficient and need to be used with a thermal store.</li> </ul>   | <ul style="list-style-type: none"> <li>Consider mechanical ventilation with heat recovery (MVHR), which provides fresh filtered air into a building whilst retaining most of the energy that has already been used in heating the building.</li> </ul> | <ul style="list-style-type: none"> <li>Solar PV and solar thermal can be stored in batteries and thermal water stores, respectively. Consider these as a compliment to any solar systems you are installing.</li> <li>Consider using batteries charged on an agile tariff to further reduce bills.</li> </ul> | <ul style="list-style-type: none"> <li>Modern equipment can be controlled efficiently through a building management system. Consider investing in a building management system if there is the ability to add sensors/meters to optimise control and measure usage.</li> </ul>   |  |  |