A checklist for retrofits

Measures to incorporate when planning a retrofit

LONDON climate change PARTNERSHIP

Retrofitting measure	Considerations	Alternatives	Reference
 Cavity wall insulation	In flood prone areas, the types of insulation used needs to be considered carefully. Insulation materials such as some mineral wool and blown insulation materials **may absorb water, become ineffective when wet** and take a long time to dry. Blown insulation may slump inside cavities once wet.	Water resilient stone wool and polystyrene is available. These products absorb very little water, retain insulation properties and dry quickly. External wall insulation may be easier to replace if damaged.	**Improving the flood performance of new buildings,** Communities and Local Government and Environment Agency. (2007). Note although the title refers to new buildings this guidance is also useful for existing buildings.
 Internal wall insulation	In certain circumstances, particularly in top floor flats occupied during the day, internal wall insulation may **increase risks of overheating as temperatures rise.** Homes (particularly tower blocks and top floor flats) with single aspect ventilation, large south facing windows and/or communal heating systems are particularly vulnerable. It is particularly important to consider this issue where people may have less adaptive capacity such as dwellings with vulnerable, elderly and/or bed-ridden occupants. Note, where internal wall insulation is used it is important to ensure the insulation is brought back along internal walls where they meet external walls, that window reveals are carefully insulated and that a suitable vapour barrier is installed. Breaks in internal insulation can lead to cold spots, moisture and finally damp.	Shutters and shading, internal blinds, external wall insulation and roof insulation can all help reduce the likelihood of overheating. External shading and shutters should be the preferred option, where possible. Internal shading tends to be less effective in general. as the solar gains are still trapped within the building envelope.	**Investigation into overheating in homes: literature review** Communities and Local Government (2012). **Adapting dwellings to Climate Change** Retrofit Advice Tool, CREW Project.
 Vertically hung gypsum plaster board	**Flood waters can wreck internal plaster work.** Damage can be much reduced by considering the way that plaster is installed.	Internal cement renders, preferably with lime content, help to reduce water penetration and suffer less damage. Hanging plaster boards horizontally can make replacement of damaged boards less expensive and enable removal for drying.	**Improving the flood performance of new buildings,** Communities and Local Government and Environment Agency. (2007). Note although the title refers to new buildings this guidance is also useful for existing buildings.

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Showers and uses of water	A simple choice of fitting can **reduce water usage and save energy with little or no impact on quality.** Heating water accounts for over 23% of the energy used in a home. It is also advisable to ensure that the water pressure in a particular home is suitable for the water saving device being installed.	Research has shown that aerated shower heads with flow rates of 8 litres per minute are widely accepted, and can even improve performance. Low flow aerated shower heads can save 22 litres of water per person per day and £26 per person per year in energy bills. Water efficient taps, toilets and baths are also available.	**Your Social Housing in a Changing Climate,** London Climate Change Partnership (2013). Contact **your water company's** efficiency team for free support and equipment. Thames Water customers should email **waterefficiency@thameswater.co.uk**
Ventilation	**Effective ventilation can increase thermal comfort as well as reducing damp and humidity.** The other benefits from appropriate ventilation include reducing the presence of radon (which can be emitted from the earth or in some cases building materials) and reducing material particulates. Particulate matter enter a building from external sources, such as industrial processes, vehicle emissions, or fires or internally from drilling or other sources of fine powder products such as talc. Air-conditioning can be very effective but produces carbon emissions, uses energy and creates waste heat. This increases the potential for fuel poverty, exacerbates the urban heat island effect and impacts of climate change. When the external temperature lies below the internal temperature night time purging of heat is possible. This difference is, however, likely to become lower under future climate change scenarios. Security, outdoor air pollution and noise concerns in urban environments can also hinder night time purging. There may be times when air conditioning is appropriate (especially for vulnerable residents during heat waves), however future planning can provide cost and energy effective alternatives to air conditioning and should be considered first. Adequate ventilation is an important consideration when installing additional insulation. Damp develops in buildings where moist air is not extracted appropriately from a room or building. A condensation problem can be treated with better ventilation. If the bathroom and kitchens do not have a fan you should consider installing them as these two rooms are responsible for most moisture in a house. As cold spots on walls increase condensation, better insulation may improve it. So having cavity wall insulation or specialist insulation materials fixed to the outside of a house can help.	Increasing cross ventilation in combination with passive measures such as shading, additional glazing, wall insulation and internal hot water pipe insulation, can significantly reduce heat gain. Mechanical ventilation, particularly where cross ventilation is not possible, has been used in some retrofits to improve performance and can be combined with heat recovery (MVHR) to minimise heat loss. Pay particular attention to ensure the design and installation of the ventilation systems is adequate. One of the biggest issues is lack of end-user understanding of the ventilation systems. Ensure installers take the time to educate users. Provision of clear easy to follow visual guides is essential. In particular guidance should illustrate the summer by-pass mechanism and need for filter maintenance. Ensure issues such as summer by-pass and filter maintenance, are considered. Where possible follow the cooling hierarchy: **1** minimise internal heat generation through energy efficient design **2** reduce heat entering the building in summer through shading, albedo, fenestration, insulation and green roofs and walls **3** manage the heat within the building through exposed internal thermal mass and high ceilings **4** passive ventilation **5** mechanical ventilation **6** choose the lowest carbon option when considering active cooling systems.	**Your Social Housing in a Changing Climate,** London Climate Change Partnership (2013). **Retrofitting Historic Buildings for Sustainability** City of Westminster (2013). **London Plan, Chapter 5,** London's response to climate change, Policy 5.9.

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 **Trees**	The tangible impacts of trees on internal comfort can be easily overlooked. **Natural shading, particularly for homes with extensive southern aspect glazing, will become increasingly important as temperatures rise.** Natural shade can reduce the urban heat island effect, improve air quality and absorb surface water runoff, which can reduce flood risk.	Broad leaf deciduous trees are preferred. They let more light in during winter months and their broad leaves have a greater surface area to absorb incoming solar radiation and airborne pollutants. Thoughtful use of trees, such as these considerations, can increase happiness and wellbeing and add monetary value to an area.	**Green Benefits in Victoria Business Improvement District: an analysis of the benefits of trees and other green assets.** iTree, (2012).
 **Flat roof refurbishment**	Traditional flat roofs at the end of their life present opportunities to integrate a number of roofing options. They could be in areas of high surface water flood risk, low cloud cover and/or high rainfall.	Replacing traditional roofs with a green roof can offer water management and ecological benefits. Often roofs can be strengthened if the design load bearing capacity is not sufficient to hold the additional weight of a green roof. Where this is not an option an albedo roof (or white roof) could be considered to assist to reduce overheating in the building.	**Guidelines for the Design and Application of Green Roof Systems,** CIBSE (2013).
 **External environment/ landscaping**	Poor management of landscape areas can exacerbate surface water flooding. Lack of analysis of water flows and few permeable surfaces can mean drainage systems overflow in periods of prolonged or heavy rainfall.	Sustainable Urban Drainage Systems (SUDS) or Water Sensitive Urban Design (WSUD) can be integrated into the landscape to create bio-diverse amenity space that also mitigates flood risk. SUDS can be low maintenance and low cost in comparison to traditional forms of engineered drainage (dependent on the surface water problem at hand). They can also help in reducing the local temperature a potential benefit in communities suffering high summer time temperatures.	**The SUDS manual** (C697), CIRIA, (free but registration required).

Design considerations

Retrofitting measure	Considerations	Possible solutions	Reference
Single measure interventions	While water efficient fittings can be effective in addressing one area of climate adaptation, few products or interventions are likely to be wholly effective on their own – an integrated response to climate change will result in a greater resilience and effectiveness.	LCCP has published a case study of the impact of integrated adaptation measures.	**Your Social Housing in a Changing Climate,** London Climate Change Partnership (2013).
Communication	In a changing climate we may also have to adapt our behaviours – communication can be as, or more effective than expensive technologies. Energy efficiency pilots have proven that awareness training, can improve the results of technological investments.	Pilot programmes have shown that clear communication with residents can significantly improve the performance of homes, reducing the costs of bills and improving value for money. This is true at the start of the refurbishment project as well as during and after. It is especially important to use existing community networks to discuss best practice. A failure to communicate may render your retrofit completely ineffective.	**RelishTM; lessons learned and outcomes of phase 1,** Worthing Homes et al. (2010). **Your Social Housing in a Changing Climate,** London Climate Change Partnership (2013).
Understandable technologies	Performance of new technologies can be highly dependent on the design, quality of installation and appropriate control by users. Technologies that are hard to understand cause problems. This is particularly relevant where maintenance teams, residents or installers are likely to have a high turnover, or have a low understanding of new technologies.	Ensure that any new technologies are combined with passive measures such as increased insulation and ventilation as well understandable and user-friendly controls. Also consider on-going support.	**Lessons from our Heat Pump Trials,** Energy Saving Trust (2010).

Beyond adaptation – Providing added value to retrofits

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Broadband	The suitability of homes for the future goes beyond just climate change. Studies have shown that access to **broadband can improve an area's economic prospects, as well as the mental health and well-being of households**. Uptake also offers benefits for landlords, improving the accessibility of online services and efficiency in contacting residents and reporting repairs.	Landlords may be able to broker a deal with a provider to provide cheap/free installations and access to residents. Adequate provision of broadband will also enable modern communications with residents such as Twitter and Facebook. This could be useful for messaging and providing updates and/or flood alerts, for example.	**UK Broadband Impact Study: Literature Review,** SQW (2013).
Internal recycling bins	It is important to make the recycling bins a part of the retrofitted property. To encourage occupants to recycle, internal storage areas should be designed into each refurbishment. It will allow residents to segregate their waste into refuse and recyclables, and store it temporarily, until it can be transferred to the external bins.	Internal recycling bins should be located in a dedicated non obstructive position. This makes recycling less of an effort and ensures greater uptake. This should be in a cupboard in the kitchen, close to the non-recyclable waste bin, or located adjacent to the kitchen in a utility room or connected garage. Free-standing recycling bins placed directly on the floor or in a cupboard are not as useful.	**Waste and Recycling Storage and Collection Guidance,** London Borough of Brent (2013).
Cycle storage	To encourage occupants to cycle, convenient and secure cycle storage facilities should be provided. A lack of safe and convenient places to leave bicycles is specifically cited as a reason for not commuting by bike. Providing the confidence that a parked bicycle will still be there on its owner's return is an important element of encouraging cycling. Better cycling storage can lead to a greater uptake in cycling thus reducing the need for short car journeys.	In residential retrofits, designers should aim to make access to cycle storage at least as convenient as access to car parking. Ways to do this in retrofit properties include: cycle stands, cycle racks, space saving systems, cycle lockers and cycle enclosures for staff and potential residents.	**Cycle Parking Guidance**, Greater Manchester Police (2009). **Code for Sustainable Homes Technical Guide** Communities and Local Government (2010) page 72. Note, although written for new build the design considerations outlined can assist in when retrofitting homes.

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