Appendix

Specification Digest

This digest provides a listing of all the specifications applied to the eight case studies.

For each specification we provide a brief description and method statement for a preferred option together with alternative options. We have listed known or preferred suppliers for each specification and the relevant product.

The preferred options for building materials have been selected for their environmental performance, either an A or A+ Green Guide rating in-line with the proposed Standard. Energy supply options have been adapted to the needs of each case study and, where possible, have been specified to benefit from economies of scale.

1. Building fabric

External walls

The general specification for low rise properties is a complete overcladding using a wood fibre insulation system with modified polymer thin coat render on top of glass fibre reinforcement mesh bedded into render basecoat *(Manufacturer: Unger-Diffutherm, UdiReco product)* The wood fibre sandwich boards are to be fixed with proprietary fixings. For low rise flats the detailing should be extended 100mm past above the roof edge.

For high rise apartments a different overcladding product should be used because of the increased exposure. The preferred option is a mechanically fixed glass fibre insulated panel system with glass fibre reinforcement mesh and acrylic render *(Manufacturer: Stotherm, mineral fibre system)*.

Alternative option:

- Mechanically fixed glass fibre insulation system with polymer thin coat render system *(Manufacturer: Isover, Sillatherm product).* Long blocks rather than panels could be used for prefabricated external walls such as the Smiths system in order to provide additional stabilisation.
- Timber framed cassette and cellulose (recycled newsprint) insulation system to rebuild in their entirety the external walls of timber frame systems such as Mactrad *(Example proprietary manufacturer: TRADIS).*

Unheated communal spaces and external walls

Complete overcladding using 20mm aerogel boards *(Manufacturer: Spacetherm, Fermocel product)*. Screw to concrete with concrete screws *(Supplier: Proctors, Spit Tapcon product)* all supplied by Proctors. Proprietary glue, gap filling and smoothing compounds are supplied so no plastering is necessary.

Windows

The general specification is triple glazed, low 'E' coated, argon filled units in double sealed FSC or PEFC certified timber frames to give 0.7-0.8 w/m^{2}k U value *(Example manufacturers: Nordan, NTech passive product or Ecoplus 'ecocontracts' product)*.

An alternative to proprietary products would be to have the frames manufactured by a local joinery company, and fitted with standard Exitex O-seals. Sections while conventionally larger in imported triple glazed window casements don't need to be if the glazing is retained by a cover strip in instead of an inset glazing bead.

Alternative options:

- **Glazing:** Low-emissivity, argon or krypton filled double glazing to give 1.1-1.3 w/m^{2}k u value *(Manufacturer: Interpane, 'iplus' product)*
- **Frame:** Laminated FSC or PEFC timber for low rise properties *(Example manufacturer: Viking)* or an aluminium clad timber frame product in order to improve durability for high rise blocks *(Example manufacturer: Nordan)*

Roof

Specification for roofs with lofts: Top-up loft insulation with cellulose rolls to reach a target depth of 350mm *(Example manufacturer: Warmcel)*.

Specification for flat roofs: Remove bitumen and apply new vapour barrier, 300mm rigid mineral wool slab insulation and then apply polyester fibre-based bitumen or equivalent waterproofing layer.

Floors

Concrete floors: Apply 10mm aerogel insulation *(Manufacturer: Spacetherm, C flooring product)* incorporating 18mm flooring grade chipboard and/or 15mm new floor boards. Trim the bottoms of doors and refit skirting boards upon completion *(Manufacturer: Gutex, Thermosafe product or Natural Building Technologies, Pavatex product)*. Building Control's opinion would have to be sought as to whether the treads of the stairs would have to covered with material of varying thickness to remove the uneven final step.

- **Suspended timber floors:** Insert 200mm batts of glass fibre wool *(Manufacturer: Knauf or Isover)* between floor joists, suspended by polyester mesh.

Alternative option for suspended floors:

- Assuming floor void of 500mm, create sub-base of 300mm clay beads *(Example manufacturer: Leca)* the remaining void between the rafters and floorboards to then be filled with foamglass beads *(Example manufacturer: Misapor)*

Doors

FSC or PEFC certified timber panel insulated doors *(Example manufacturer: Bereco)*. Proprietary products are, however, currently expensive. To reduce costs doors could be designed and manufactured by a local joinery company. Example specification: 44x25 softwood frame, doubled up around lock area, phenolic foam filling with 9mm FSC plywood glued to both sides. This produces a U-value of 0.84W/m^2/K.

2. Energy supply measures

Individual solar thermal supply

The general specification is for 4m^2 of evacuated solar thermal tubes *(Example manufacturer: Navitron, SFB30-58 product)* combined with 250 litre twin coil thermal store with insulated jacket, expansion tank, 2 x 3 port diverter valve, pump station and controller.

The solar heat source to supplemented, where necessary, by a 4 kWth heating source – either electric immersion or gas boiler. In some of the case studies the backup heat source is to be installed in advance of the solar supply eg. Cophall Street, Sandwell.

In a number of the case studies a larger solar array with an oversized thermal store has been specified – see alternative option below.

Alternative options:

- **Utilise existing thermal store:** Retrofit a second coil using the spare plumbing connection for an immersion heater OR retrofit an external heat exchanger.
- **Large thermal store:** Install 560 litre thermal store *(Manufacturer: Consolar, Solus II product)* in combination with 6m^2 evacuated tubes
- **Solar collectors:** Install 4 m^2 or 6 m^2 flat plate collector product (as appropriate) to match the the 250 litre or 560 litre stores *(Example manufacturer: Energie Solaire, Azul product)*

Communal solar thermal supply

System specified to supply 12 flats ***(Okement Drive case study, Wolverhampton)***. Construct 4.3m x 3.1m out-house with a pair of outward opening 1100mm doors, linked to the block of flats by service duct. Fit-out with 2 x 2200 litre thermal stores *(Manufacturer: Consolar, Solus II product)*.

To be supplied by 50m^2 of evacuated solar thermal tubes (Manufacturer: Navitron, SFB30-58 product) installed on the roof of the flats as one array, supplying insulated flow and return distribution pipework, served by an expansion tank, 2 x 3 port diverter valve, pump station and controller.

The thermal store is to supply heat to each flat via insulated flow and return distribution pipework, supplemented by the existing individual gas boilers in each flat which will be modified to provide backup heat/hot water.

Each flat to be provided with digital heat metering with IP/wireless transmission to facilitate remote meter reading *(Example supplier: Switch2)*.

Communal gas-fired heating supplemented by solar thermal

Roof mounted system specified to supply 45 flats ***(Birchcroft, Sandwell)***. Prefabricated plant room lifted into place and containing 540 kWth condensing boiler(s) together with pumps and controllers. The plant room to supply insulated flow and return mains (20-25mm pipe dimension) which are to be routed to each flat via existing service ducts.

The gas system to be supplemented by 75m^2 of evacuated solar thermal tubes *(Example manufacturer: Navitron, SFB30-58 product)* or flat plate collectors (Example manufacturer: Energie Solaire, Azul product) installed on the roof of the block, linked together as one array, and supplying insulated flow and return distribution pipework, expansion tank, 2 x 3 port diverter valve, pump station and controller.

The system will utilise the existing storage cylinders in each flat to provide domestic hot water, but will not require new radiators (see ventilation system specification below). The boiler house is to be integrated with the buildings ventilation system.

Each flat to be provided with digital heat metering with IP/wireless transmission to facilitate remote meter reading *(Example supplier: Switch2).*

Communal mechanical ventilation with heat recovery

Install roof mounted unit serving 45 apartments to provide 57 cubic metre/hr (16 litres/second) air handling capacity per property. The intention would be that existing shared service ducts terminating at the roof would provide both inlet and extract. Within each property a bespoke hot water coil would be specified for installation on the fresh air inlet from the central service duct. This will provide supplementary air heating. A thermostatic controller with timer would be installed which would draw hot water to the coils from the communal heating supply on demand.

Biomass heating stove and back boiler

Replacement stove with central heating boiler utilising existing flue, wet radiators and, where deemed suitable, thermal storage cylinder with electric immersion heater *(Manufacturers: Dunsley, Highlander 8 or 10 product or Parkray, Chiltern product).*

Solar thermal is to be installed to supplement the stove – a third heating coil would therefore need to be retrofitted if the design of the existing cylinder facilitates it *(see retrofit specification)*. If the cylinder is not suitable then a replacement 250 litre three coil cylinder would need to specified.