

NOTTINGHAM
ECOHOME
AND
PERMACULTURE
GARDEN

PENNEY POYZER



DECC RETROFIT PIONEER AWARD 2012



A WHOLE PLOT APPROACH TO ECO RETROFITTING
SUBURBIA

A 14 YEAR EXPERIMENT IN URBAN AUTONOMY

- HOW MUCH ENERGY COULD WE SAVE/GENERATE?
- BY HOW MUCH COULD WE REDUCE OUR USE OF WATER?
- HOW MUCH FOOD COULD WE PRODUCE?



INSULATE EVERYTHING!

- REROOF REUSING MOST OF OLD SLATES
- INSTALL BREATHABLE UNDERLAY TO PROTECT INSULATION
- EXTEND VERGE OVERHANG FOR FUTURE EXTERNAL INSULATION





BEFORE

- POLYSTYRENE CEILING TILES
- PLASTER AND LATH



DURING

- 300MM PLYWOOD WEBS FASTENED TO EXISTING RAFTERS
- BREATHER BOARDS



THEN

- POLYTHENE AIR-TIGHTNESS MEMBRANE
- CELLULOSE INSULATION BLOWN INTO HOLES IN PLASTERBOARD

WALLS: SIDE AND REAR



BEFORE

EXISTING EXTERNAL WALLS 9 INCH SOLID BRICKWORK WITH FAILING BRICKS

THEN

EXTERNAL INSULATION TO SIDE AND REAR
COMPLETED JUNE 2004

RESULT

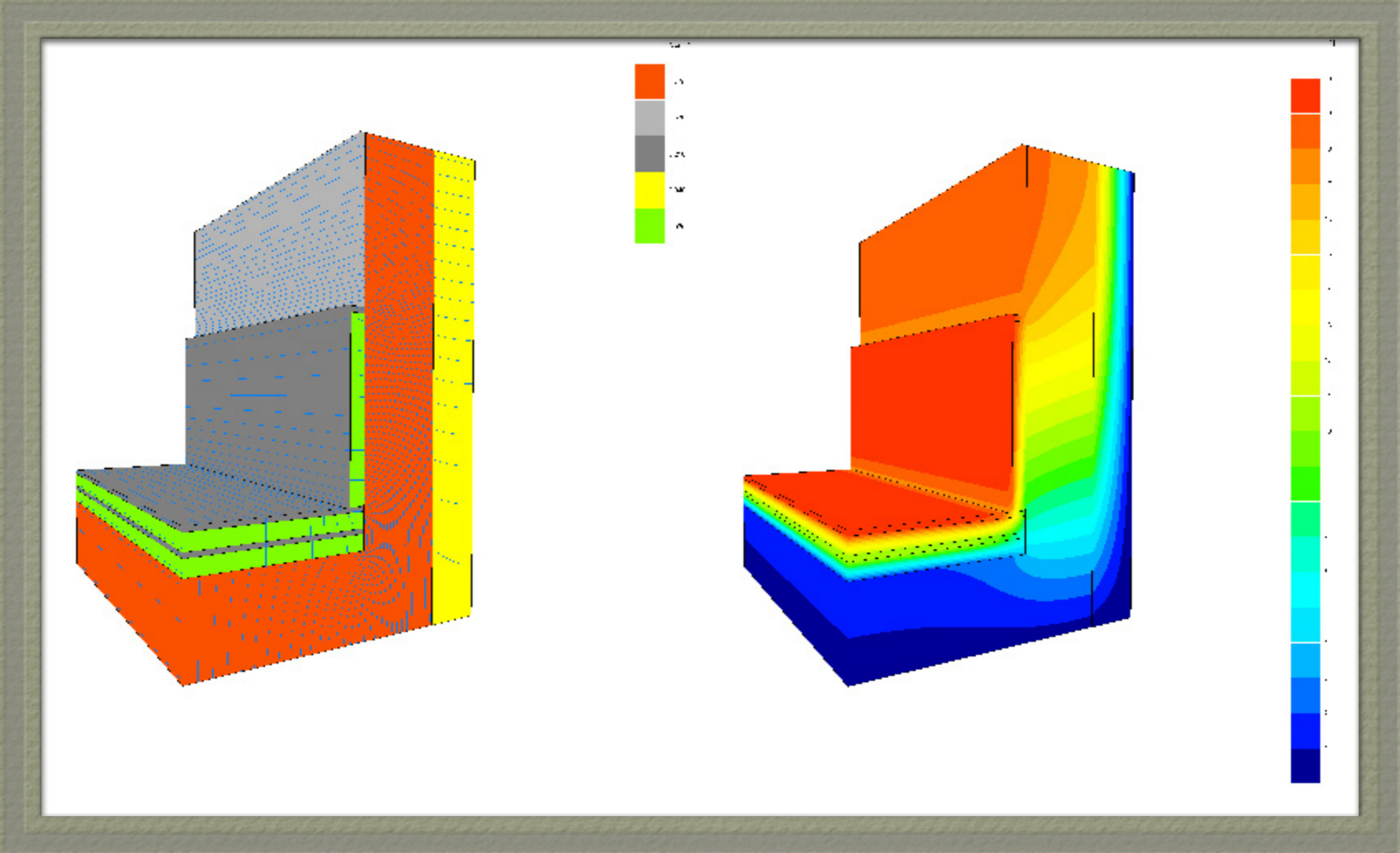
BRICKS PERMANENTLY PROTECTED

FRONT WALL

BRICK APPEARANCE PRESERVED
TO STAY WITH THE GRAIN OF THE
STREET SCENE

- INSULATE ON INSIDE
- TWO LAYERS OF 50MM ZERO OZONE DEPLETING PHENOLIC FOAM BACKED PLASTERBOARD
- COMPARABLE INSULATION LEVELS TO EXTERNAL CLADDING
- RIGID BOARDS CAN BE CUT TO SHAPE AND DETAILS FORMED
- RETURNS AT THE SIDES TO FORM OVERLAP WHICH REDUCES COLD BRIDGING AT CORNERS





BRE* THERMAL MODEL OF INSULATION RETURN SHOWS
EFFECTIVENESS OF DETAIL IN REDUCING HEAT LOSS

* BUILDING RESEARCH ESTABLISHMENT

GROUND FLOOR: SOLID

- REAR SECTION OF HOUSE HAD SOLID UNINSULATED AND UN DAMP-PROOFED TILED FLOOR AND CHANGE IN LEVEL
- EXCAVATED DOWN AND LAID DAMP PROOF MEMBRANE
- 150MM POLYSTYRENE WITH 50MM EDGE UPSTANDS
- 100MM CONCRETE SLAB



FINISH

CORNISH SLATE LAID
RANDOM



GROUND FLOOR: SUSPENDED OVER CELLAR

- 100MM SHEEPSWOOL BETWEEN THE JOISTS SELF SUPPORTING DURING INSTALLATION
- AIR TIGHTNESS BREATHER MEMBRANE
- 60MM WOOD FIBRE BOARD FIXED TO UNDERSIDE MAKING FULLY BREATHABLE NATURAL CONSTRUCTION WF BOARD DOWNSTANDS WILL BE ADDED TO FLOOR/WALL JUNCTIONS



DOORS & WINDOWS:

- INHERITED 'STYLISH'
UPVC THROUGHOUT
- DILEMMA WHAT TO DO -
TEMPTED TO REPLACE ALL
BUT WHAT ABOUT
DISPOSAL?
- MANY UPVC UNITS
STARTED TO FAIL - POOR
QUALITY AND DIFFICULT
TO REPAIR



PARTIAL REPLACEMENT WITH HIGH PERFORMANCE TIMBER JOINERY

REAR NORTH FACING TRIPLE GLAZED
FRENCH DOORS IN SOFTWOOD



TWO BATHROOM WINDOWS IN OAK
ARGON FILLED LOW E DOUBLE



HEAT RECOVERY

- HIGH AIR TIGHTNESS REDUCES HEAT LOSS
- VICTORIAN HOUSES RELIED ON POOR AIR TIGHTNESS FOR ADEQUATE VENTILATION
- CONTROLLED VENTILATION VERY IMPORTANT
- BOTH BATHROOMS AND BOTH KITCHENS HAVE HEAT RECOVERY FANS WHICH SAVE UPTO 80% OF AIRBORNE HEAT



LED LIGHTING



- ULTRA EFFICIENT - 20% POWER OF EQUIVALENT HALOGEN
- BULBS CAN BE DIRECTED BETTER
- RGB VERSION CHANGES COLOUR

EACH SPOT:

- USES 3 W
- LASTS UPTO 100,000 HOURS (THAT'S 11 YEARS CONTINUOUS)
- BRIGHT ENOUGH FOR TASK LIGHTING NOT JUST AMBIENT

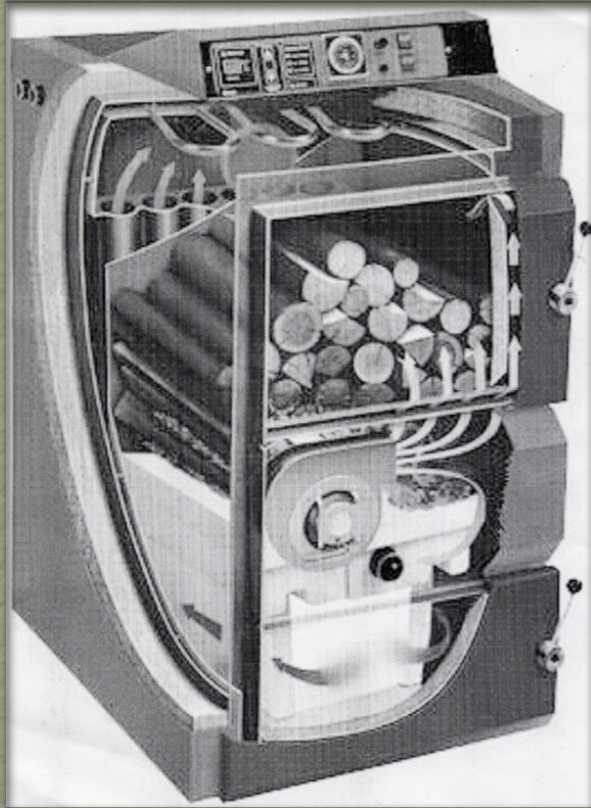


RENEWABLES



4 SQUARE METRE FLAT PLATE SOLAR PANEL
CONTRIBUTES 50% TO ANNUAL HOT WATER

WOOD



WOOD-FIRED BOILER FOR CENTRAL HEATING AND HOT WATER TOP-UP

MORE EFFICIENT AND CONTROLLABLE THAN WOOD BURNING STOVE WITH BACK BOILER

1100 LITRE ACCUMULATOR STORES AND DISTRIBUTES HOT WATER TO THE RADIATORS AND DOMESTIC USE

COST £5000 - £3400 OF WHICH WAS MET BY GRANTS

NEED TO SOURCE, COLLECT AND STORE WOOD

THEN WE NEED TO CUT, LOAD, LIGHT AND KEEP CHECKING THE WOOD

RENEWABLE ENERGY AND LOW ENERGY CONSTRUCTION SAVES £2,000 A YEAR

PROJECTED REDUCTIONS

(BASED ON SAP THERMAL MODEL):

- SPACE HEATING DEMAND DOWN TO 30-40% OF ORIGINAL
- COMBINED SPACE HEATING AND HOT WATER CO₂ EMISSIONS DOWN TO ~3% (**16T DOWN TO 0.5T**)
- EXTERNAL ENERGY DEMAND FROM UTILITIES AND CO₂ EMISSIONS REDUCTION DOWN TO 15-20% OF ORIGINAL (**19T DOWN TO <3T**) (ASSUMING ELECTRICITY IS SUPPLIED ON BROWN TARIFF)
- REMAINDER SUPPLIED BY OFF-SITE RENEWABLE ELECTRICITY (GREEN TARIFF). THIS REDUCES THEORETICAL CO₂ EMISSIONS AT THE POWER STATION DOWN TO 7-8% OF BROWN TARIFF RATE.

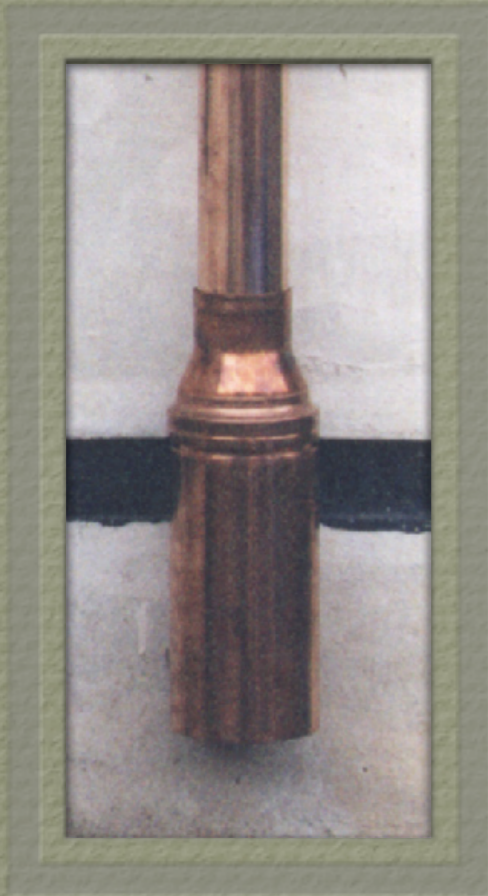
ADAPTING HOMES AND GARDENS TO MANAGE WATER

- LOW WATER USE GOODS: TOILETS, WHITE GOODS, SHOWER HEADS
- WHOLE SITE APPROACH TO MANAGEMENT
- BEHAVIOUR CHANGE



RAINWATER HARVESTING

- COLLECTED OFF ROOF AND STORED IN CELLAR TANKS



- OUR OVERALL WATER USE 55 L / PERSON / DAY (1/3 OF AVERAGE)



POROUS PAVING, WATER STORAGE AND ATTENUATION

FOOD/BIODIVERSITY: PERMACULTURE



SMALL URBAN PERMACULTURE GARDEN: RAISED BEDS

MAXIMISING VERTICAL METRE



GREEN OAK STRUCTURES: STORAGE/GREEN ROOFS



GREEN ROOFS, MATERIALS AND LAYERING



A CRAFTED SOCIAL SPACE FOR GROWING AND BIODIVERSITY

FOOD WATER ENERGY



BY 2050 WE NEED TO BE GROWING 70% MORE THAN WE DO NOW

IMMERSE THE BUILT ENVIRONMENT IN EDIBLE URBAN LANDSCAPE

PROTECTING OUR FRESH WATER SUPPLIES MATTER OF GLOBAL URGENCY

DEATH OF OUR OCEANS MEANS DEATH OF THE PLANET

URGENT NEED TO PRODUCE LOW CARBON ENERGY LOCALLY, DEMOCRATICALLY

DECC PREDICT POWER CUTS BY 2015

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