Sound Insulation and the Code for Sustainable Homes
Designing for the Code

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24th October 2007

PRP Architects Recent Projects:

- St Matthews, Brixton – low carbon development with Zedfactor
- Crossways Estate – sustainable regeneration of residential estate
- Sigma Home – demonstration Code Level 5* home at BRE

PRP Environmental Services:

- Code for Sustainable Homes/ EcoHomes
- Renewable energy
- Sustainable architecture
- Sustainability statements for planning requirements
- Building Regulations Part L1A
- BREEAM advice

UK and EU Policy

UK Policy

- Draft Climate Change Bill
  - *set staged targets to reach 60% CO2 reduction by 2050*
  - *26-32% by 2020 – all to be legally binding*

- PPS1 addendum – Planning and Climate Change
  - *'significant proportion of substantial developments energy – LZC solutions'*
  - *demonstrate how Building Regs to be met at planning stage*

- PPS22 – Renewable Energy

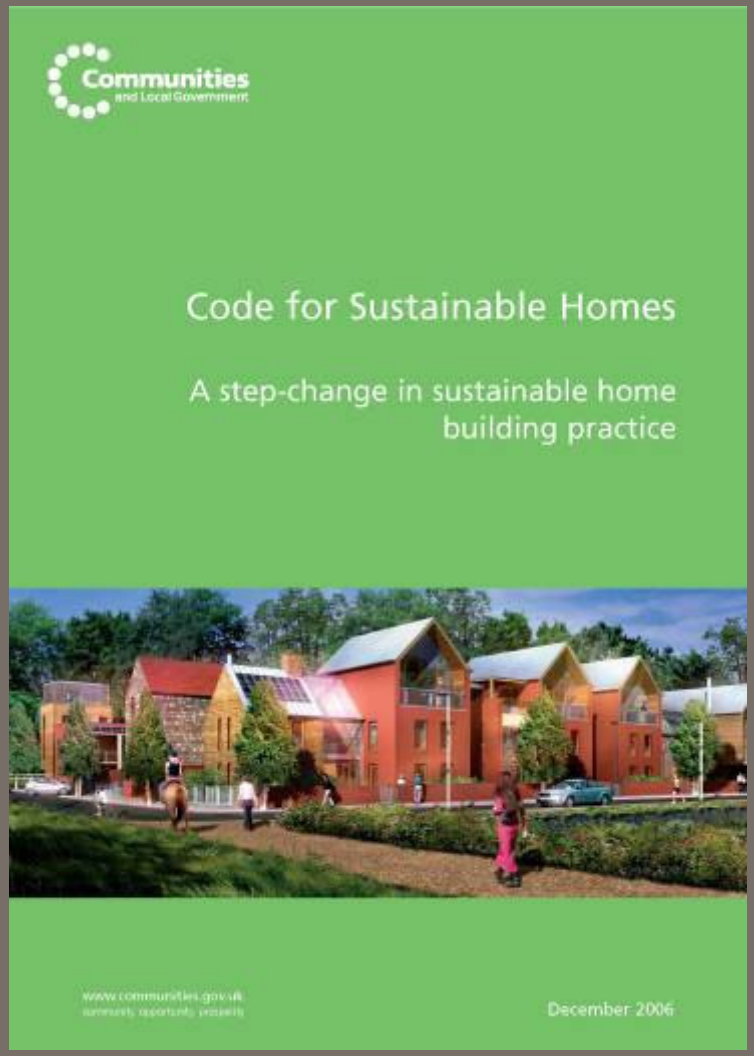
- Building Regulations Part L1

- ECA scheme, Climate Change Levy, Aggregate tax, Landfill tax

EU Policy

- Energy Performance of Buildings Directive

Code **for Sustainable Homes**



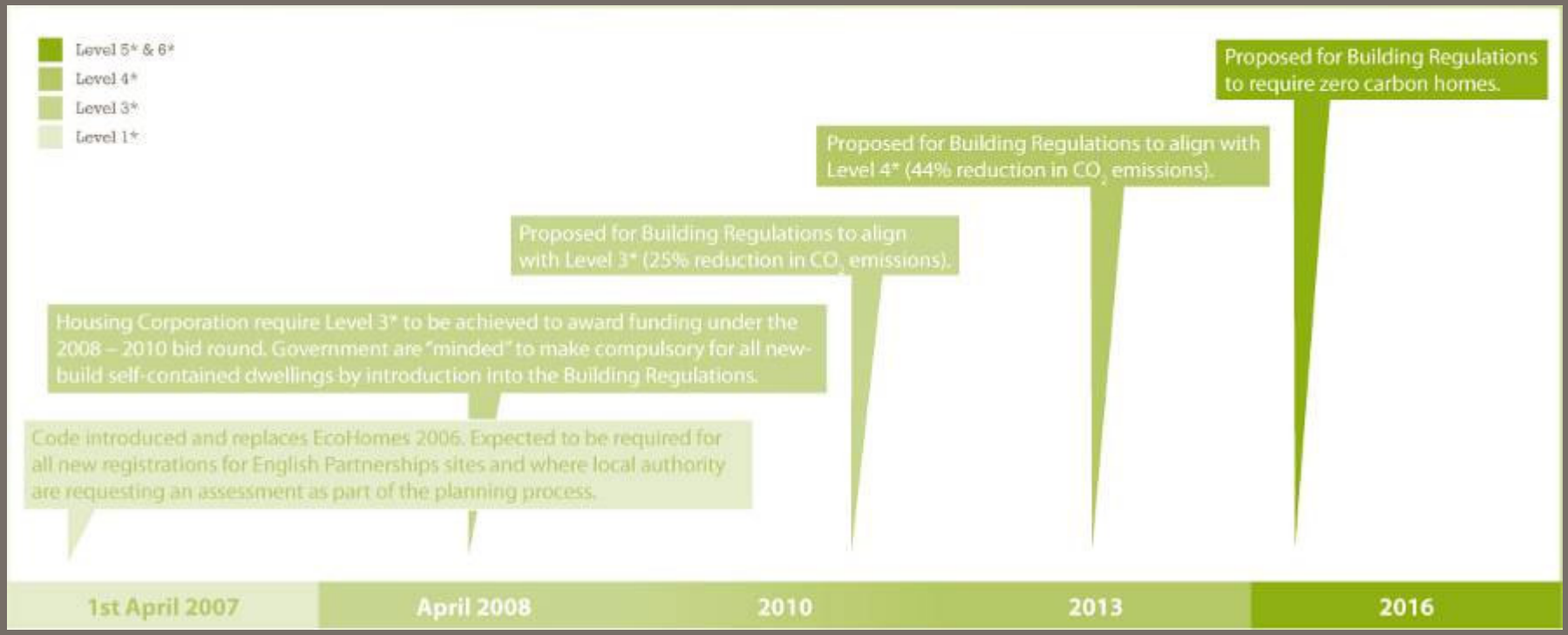
- Replaces EcoHomes for new-build homes (England)
- Operated by CLG with BRE
- Six levels: 1* to 6*
- Entry level minimum requirements in 5 sections
- Minimum requirements for CO_2 emissions
- Minimum requirements for water efficiency
- Two-stage process
- No location factors – transport or amenity

Scoring System

- Assessment is for each *dwelling* rather than for whole development
- Minimum requirements for CO_2 emissions and water efficiency for all levels
- Other minimum requirements have no score associated

Rating	Energy score required (%)	Water score required (%)	**Total % required**
1*	1.2	1.5	**36.00**
2*	3.5	1.5	**48.00**
3*	5.8	4.5	**57.00**
4*	9.4	4.5	**68.00**
5*	16.4	7.5	**84.00**
6*	17.6	7.5	**90.00**

Introduction strategy



Housing Corporation – Level 3* 2008 – 2010 Bid Round
Housing Corporation – proposed Level 4* from 2010
Building Regulations – government "minded" to include mandatory rating (not necessarily assessment) from 2008

Hea 4 Sound Insulation

- Four credits available (1.16% per credit)
- No Mandatory Elements

- 1 credit: 3dB better than Part E (2003/2004) for impact/ airborne noise
- 3 credits: 5dB better than Part E (2003/2004) for impact/ airborne noise
- 4 credits: 8dB better than Part E (2003/2004) for impact/ airborne noise

- Demonstrated through pre-completion testing OR Robust Details
  - risk associated with testing due to requirement for remediation

- Awarded by default for detached (four credits) or where no separating walls/ floors between habitable rooms (three credits)

Other Related Code Credits

- Significant:
  - Mat 1 Environmental Impact of Materials (Green Guide)
  - Mat 2 Responsible Sourcing of Materials: Basic Building Elements
- Minor impact
  - Pol 1 Global Warming Potential of Insulants
    - Most insulation materials now have GWP of < 5

Mat 1 Environmental Impact of Materials

- Green Guide (BRE 2007)
  - Not published but draft spreadsheet for Code assessments
  - Assessment must be registered to ensure Green Guide rating applies

- Mandatory item:
  - At least 3 of 5 key elements (roof; external walls; internal walls (partitions and separating walls); ground and upper floors; windows) must be at least ‘D’ rated

Draft Green Guide rev. D: Separating Walls

- Significant advantage if blockwork can be avoided, e.g.
  - where no load-bearing walls required (e.g. concrete frame)
  - Steel or timber frame construction
- Aircrete cavity blockwork best option where blockwork is required ('B' rating possible)
- NB Selected constructions only shown

Aircrete blockwork cavity wall, minimum 75mm cavity, 2 sheets staggered plasterboard to both sides.	B
Solid dense blockwork (≈1950 kg/m3) with 2 sheets plasterboard on both sides.	B
Solid medium density blockwork (≈1450 kg/m3) cavity wall (parged), minimum 75mm cavity, 2 sheets of plasterboard to both sides.	D
Non load bearing, precast concrete wall panel with plasterboard and paint	E
Steel jumbo stud partition, plasterboard and skim, glass wool insulation, paint	**A**
Tunnel Form with plaster skim finish and paint	D
Two layer plasterboard lined timber framing, plywood structural sheathing with absorbent material (mineral wool)	**A+**

Draft Green Guide rev. D: Separating Floors

- Significant advantage if concrete can be avoided, e.g.
  - Steel or timber frame construction
- In situ concrete performs badly here
- Chipboard on battens with acoustic leg cradles best option for concrete plank construction ('B' rating possible)
- 'Tunnel form' good for energy efficient cooling e.g. Termodeck/ thermal mass, but less appropriate for residential as cooling should be designed out?

Beam and dense block (≈1950 kg/m3) flooring, grouted using C30 mix, levelling screed, sand cement screed laid over 25 to 30mm resilient rock mineral wool slab 140kg/m3	C
Hollow precast prestressed concrete planks, grouted using C30 mix, 6mm rubber separating layer, 65mm sand/cement screed	D
Hollow precast prestressed concrete planks, grouted using C30 mix, levelling screed, tongue and groove overlay chipboard laid over 25 to 30mm resilient rock mineral wool slab 140kg/m^3	C
Hollow precast prestressed planks, grouted using C30 mix, (screed), acoustic leg cradles, timber battens and t&g chipboard. 63mm thick void filled with insulation quilt.	B
In-situ concrete slab with insulation and chipboard raised floor.	D
Steel/concrete composite floor deck, levelling screed, tongue and groove overlay chipboard pre-bonded with decoupling fibre.	B
Timber frame base with ceiling and platform floor; Joists supporting OSB deck with min mass 20kg/m^2 and 25mm resilient layer (mineral wool 60-100kg/m^3) with floating floor of 2 layers plasterboard/chipboard min 8mm and 25kg/m^2 combined mass.	**A+**
Tunnel form with painted fair-faced finish ceiling and screed on isolating acoustic layer	E
Volumetric floor structure with steel joists (for modules above and below) 22mm chipboard floor decking and OSB sheathing and plasterboard ceiling.	**A+**

Performance of Robust Details

- In reality, testing needed in many cases for 5dB improvement:
  - performance of 3dB improvement only is demonstrated by lowest end of range of performance for many Robust Details

- Testing also required for most flats, due to combination of separating wall/ floor details to meet Building Regulations

Mat 2 Responsible Sourcing of Materials: Basic Building Elements

- Advantage to timber frame due to scoring system for materials e.g.
  - FSC/ CSA/ SFI/ PEFC timber = 3 points
  - MTCC/'Verified'/SGS/ TFT timber = 1.5 points
  - EMS for key processes & supply chain = 1.5 points
  - EMS for key processes = 1 point

  Significantly easier to accumulate points with timber frame.
  Possible issues with plasterboard – difficult to source with EMS

Ene 1 Carbon Dioxide Minimum requirements

- Level 1* = 10% improvement over TER (B. Regs Target Emission Rate)
- Level 2* = 18% improvement
  - building fabric/ passive solar/ SEDBUK “A” boiler/ controls
- Level 3* = 25% improvement
  - renewables required for most dwellings, e.g. solar thermal, heat pumps, alternatively CHP where appropriate
- Level 4* = 44% improvement
  - renewables required for all dwellings, e.g. biomass, heat pump, PV
- Level 5* = 100% improvement
  - biomass plus PV
- Level 6* = ~150% improvement (“zero carbon”)
  - biomass or biomass CHP, plus large area of PV or large-scale wind turbine

Notes on Ene 1 Carbon Dioxide part 1

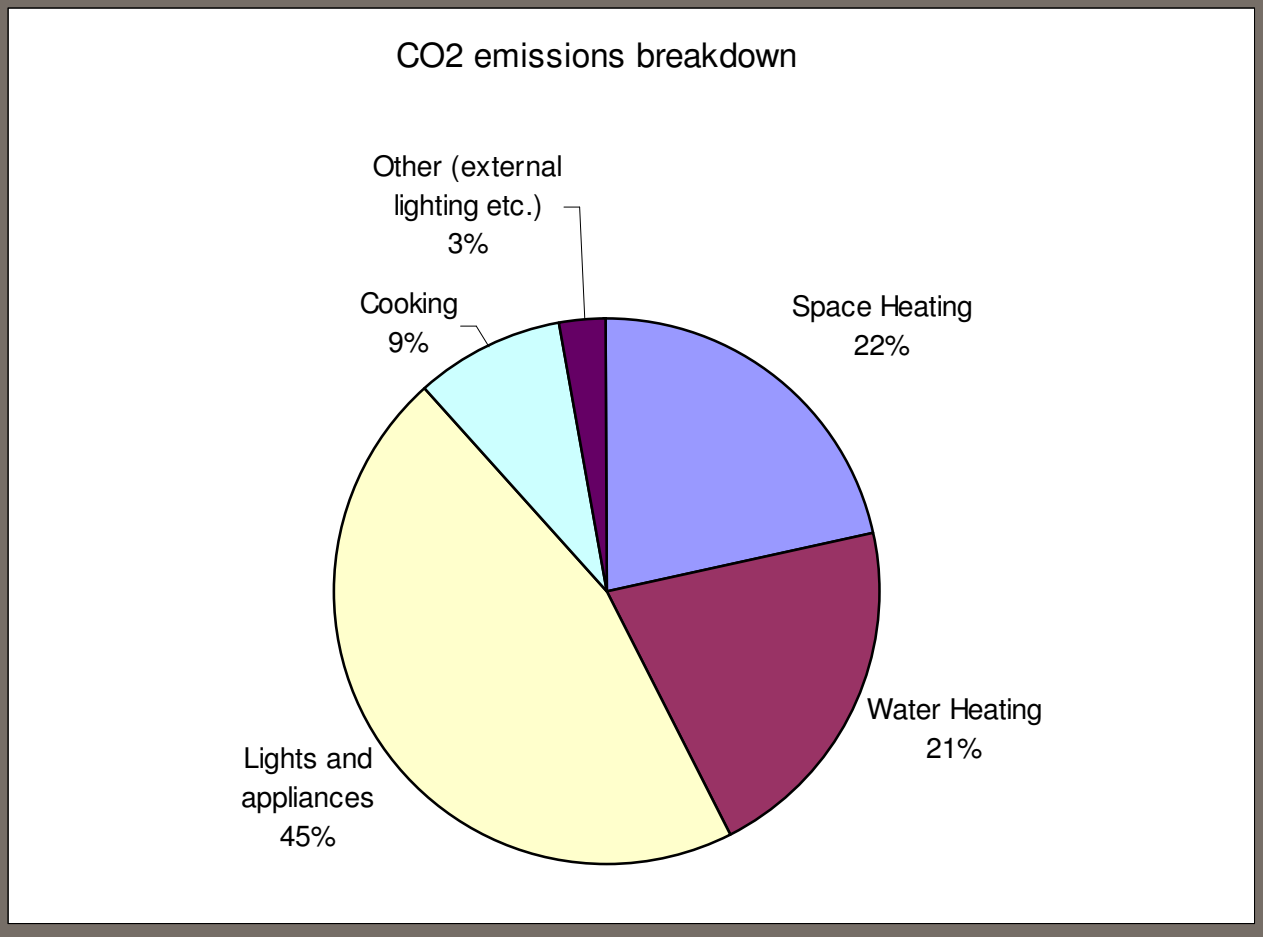
- Good U-values (thermal performance) an advantage
- Generally more cost-effective than additional renewables, although not always true at very high levels of insulation
- Standard masonry construction and frame construction allow limited scope for improvement – driver towards widened cavities or SIPS pre-fabricated panel construction
- Pre-fabricated panels offer more scope to reduce air permeability
- Less of a driver for good thermal performance with biomass space/ water heating, although still sustainable choice to reduce energy/ fuel consumption

Notes on Ene 1 Carbon Dioxide part 2

- Accredited Construction Details important to prevent thermal bridges
- Low air permeability significant
- Relationship with Robust Details still to be determined
- Renewables and mechanical ventilation systems could compromise sound insulation if incorrectly detailed or installed
- **Code Level 6*:** maximum Heat-loss Parameter of 0.8 W/m^{2}K is mandatory: requires amazing U-values and much reduced glazed areas (conflict with passive solar design?)

Energy consumption of typical dwelling – 3-bedroom house

- New-build 3-bedroom house – 84sqm
- CO_2 emissions - 3,100kg/annum
- Designed to meet Part L1a (2006)



Credits and Weighting Summary

Category	No. of Credits in Category	Environmental Weighting Factor
Energy/CO_2	29	36.4%
Water	6	9%
Materials	24	7.2%
Surface Water	4	2.2%
Waste	7	6.4%
Pollution	4	2.8%
Health and Wellbeing	12	14%
Management	9	10%
Ecology	9	12%
Total	104 points	100%

Code for Sustainable Homes – Level 3 CO2 emissions 25%

Option 1 Energy efficiency measures only

- Possible specification:
- Lightweight or masonry - 200mm insulation
- Roof - 350mm insulation
- Ground Floor - 85mm insulation
- Windows – DG 18mm gap argon fill low-e
- Air permeability rate of 7m^3 / hm^2 @ 50Pa

Option 2 Renewable technologies only

- e.g. 17sqm of photovoltaic

Wat 1 Internal Potable Water Consumption

Mandatory requirement – method flexible based on Code calculation method

Average UK use – 150 litres per person per day

Level 1*/2* – 120 litres per person per day

Level 3*/4* – 105 litres per person per day

- Dual Flush 6/4 litre WC
- Water-efficient taps e.g. 1.7 litres/ minute
- Small bath – e.g.150 litre
- 6 litre shower

Level 5*/6* – 80 litres per person per day

- Dual Flush WC
- Water-efficient taps e.g. 1.7 litres/ minute
- Small bath or no bath
- <6 litre shower
- Best-practice white goods where specified
- Rainwater harvesting (houses) OR
- Greywater for WC flush
- Composting toilets?

Stewart Milne Demonstration House – Sigma Home

- First Code Level 5* rating for demonstration project
- Built at BRE for “Offsite” exhibition in June 2007
- Passivhaus U-values (typically 0.15 W/m^{2}K)
- Designed for air permeability of 1 m^3/hm^2
- Solar thermal hot water
- Wind turbines
- Photo-voltaics
- Greywater reuse (“Ecoplay”)

Stewart Milne Demonstration House

- Timber studwork separating wall
- Previous test results confirmed 8dB improvement possible
- No sound testing undertaken as demonstration house
  - door through separating wall due to route for tour of home!

Stewart Milne Demonstration House

Stewart Milne Demonstration House

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