Pol 1 Insulant GWP

Credits available: 1

Aim

To reduce the potential global warming from substances used in the manufacture or composition of insulating materials.

Credit Requirements

All dwellings in the development must meet the following criteria.

Credits	
1	Specifying insulating materials, that avoid the use of substances that have a global warming potential (GWP) of 5 or more (and a ODP of zero) , in either manufacture or composition, for the following elements: • roof (including loft access) • wall – internal and external (including doors, lintels and all acoustic insulation) • floor (including foundations). • Hot water cylinder, pipe insulation and other thermal store

Applicability

The same approach is taken for both new build and refurbishment.

ALL dwellings, throughout the development, must meet the requirements.

Main Information to be Provided by the Developer

1. Specifications must state the insulation used, location and details sufficient to meet the *Credit Requirements* and the *Guidance* below.
2. The appropriate drawings should show the insulation used, location and details sufficient to meet the *Credit Requirements* and the *Guidance* below.
3. Manufacturer's details confirming for those insulation materials not inherently having a GWP of less than 5, giving sufficient information to check that the insulation meets the Credit Requirements both in composition and manufacture.

Guidance

1. If the details are stated in the specification, they should also be on the drawings.

   Relevant drawings would be the general arrangement, plumbing, construction details or similar, where the location and type of insulation is stated
2. The compliance requirements apply to:
   - any blowing agents used in the manufacture of an insulant,
   - blowing agent used to spray the insulant in place,

- the materials used in the product itself.

3. For insulants that do not inherently have a GWP of less than 5 and an ODP of zero, (in either manufacture or composition), the developer will need to confirm that the insulant has a GWP of less than 5 and is free from ozone depleting substances.
   - Manufacturer's confirmation is required that the material has both a GWP of less than 5 and a zero ODP. Typically this may be supported by an independent UKAS accredited certification body.
   - Typical insulants that do **not** inherently have a GWP of less than 5 and a zero ODP will include polyurethane foams, polyisocyanurates and others.
   - Typical insulants that inherently have a GWP of less than 5 and a zero ODP will include natural insulation materials (if not blown) such as:

mineral fibre	cellulose insulation
glass fibre	wood fibre board
cork	wool
cellular glass	flax
nitrile rubber	recycled newspaper and jute

4. Note that the use of ozone depleting substances (ODP) in the manufacture or composition of insulating materials is now prohibited in the UK /EU. However there may be a limited amount of such materials stock piled for use. Only products with absolute zero ODP are acceptable. Negligible levels of ODP will not comply.
5. If there is no insulation in any of the elements described, the relevant credits will be given as default.
6. If a combi-boiler is specified, and no hot water cylinder or thermal store is required, the credit for hot water cylinder is achieved, provided the combi-boiler and any insulated pipes do not use ozone-depleting substances in their manufacture.
7. Ensure that information is provided for:
   - both external and internal walls
   - insulation in the foundations, loft access doors and other doors
8. Ensure that all elements/ parts of elements are checked. For example, the roof construction may be pitched with mineral fibre insulation specified. However, there may be a small amount of flat roof construction where extruded polystyrene is used.
9. The manufacturing process of insulating materials changes regularly, because of this EcoHomes does not include a complete list on specific insulating materials that comply. Unless solid natural insulants are being specified, it is likely that only those products using CO_2 or pentane as a blowing agent will comply at present.

Flats

10. There is no specific guidance for flats/apartments. The standard approach should be followed.

Refurbishment

11. Assess any **new** insulation to be put in.

12. Existing insulants will be deemed to satisfy these criteria as default, as no new Ozone Depleting or Global Warming potential substances are emitted.

Special Cases

There are currently none for this issue.

Supplementary Guidance

A: Definition of Global Warming Potential

Global Warming Potential (GWP) is defined as the potential for damage that a chemical has relative to 1 unit of carbon dioxide, the primary greenhouse gas.

B: Definition of Ozone Depletion Potential

Ozone Depletion Potential (ODP) is defined as the total change in ozone, per unit mass, when the substance has reached a steady state in the atmosphere.

Further Information

See *References* below.

Background

The 'Greenhouse Effect' results from increased emissions of certain gases associated with modern day life. Most of the heat from the sun (short wave solar radiation) that reaches the Earth is absorbed by the surface and warms it up, while about a third is reflected back through the atmosphere into space. Some of this reflected radiation is trapped at the top of the atmosphere by a layer of gases which absorb and recycle the heat back towards the Earths surface and so warm it still further. These gases act in a similar, yet different, way to the glass in a greenhouse – heat is allowed in but cannot get out – hence we have the 'Greenhouse Effect'.

Global warming potential (GWP) is a relative measure of how effective a gas is at preventing the passage of infra-red radiation (i.e the Earths's heat). The GWP measures the total energy absorbed by 1 kg of released gas over a fixed period of time. CO2 is given a GWP of 1.0.

The Kyoto Protocol has set limits to six specific gases that contribute towards global warming. These are carbon dioxide, methane, nitrous oxide, hydroflourocarbons, perflourocarbons and sulphur hexafluoride. In the table below show the GWP for each of these gases.

Gas	GWP
Carbon Dioxide	1
Methane	21
Nitrous oxide	310
Hydroflourocarbons – HFC's	140-11700
Perflourocarbons –PFC's	6500-9200
Sulphurhexaflouride –SF6	23900

Reference: *National Atmosperic Emissions Inventory, UK Emissions of Air Pollutants 1970-2003*, DEFRA, UK, (GWP) based on 100 year time horizon.

Following the Montreal Protocol the production of CFC's is now banned. The use of HCFCs as the blowing agent for insulating materials has also been phased out in the UK and Europe. However, as there may still be stockpiles available the ODP must also be verified for this credit.

Many insulation blowing agents have significant global warming potential (GWP), including HFCs which are commonly used as replacements for HCFCs. Therefore this credit requires that substances with a significant GWP are avoided in the manufacture of any insulating materials used in the building.

References

Guidance on the EC Regulation No 2037/2000 on Substances that deplete the ozone layer, October 2000, DTI. Available on-line at http://www.dti.gov.uk/access/ozone.htm

Defra, Environmental statistics
http://www.defra.gov.uk/environment/statistics/globatmos/gagginvent.htm

Pol 2 NO_x Emissions

Credits available: 3

Aim

To reduce the nitrous oxides (NO_x) emitted into the atmosphere.

Credit Requirements

Credits are awarded on the basis of NO_x emission arising from the operation of all space heating and hot water systems across the development in accordance with the following criteria.

Credits	Dry NO_x level (mg/kWh)	Boiler class (BS EN 297: 1994)
1	≤100	4
2	≤70	5
3	≤40	above

Applicability

The same approach is taken for both new build and refurbishment.

95% of dwellings throughout the development must be served by heating and hot water systems with an average NO_X emission rate of less than or equal to the levels listed above.

Main Information to be Provided by the Developer

1. Details of primary and secondary space and hot water heating systems. Such details should include the estimated annual consumption (from the SAP calculations).

2. Where fossil fuel boilers are present:

   - Make, model and dry NO_x levels and/or class of boiler specified.
   - Confirmation of NO_x levels and/or class from manufacturer, e.g. manufacturer's literature. Printouts from manufacturers' websites are acceptable if the web address is included. (Note: If NO_x levels are not in the literature, details can generally be obtained from the technical sales department of the relevant manufacturer. Full details of the source must be given in the assessor's report.)
   - Type of flue i.e. open or balanced.
   - NO_x levels may be stated in the general contract specification as an alternative to supplying the make and model of a specific boiler.

3. Where any other system (apart from grid electricity) is present:

   - Details of the system
   - Confirmation of NO_x levels from manufacturer.

4. Where the heat load is estimated to be less than 8% of the heat load of a Building Regulation (2006) compliant home of the same type and size, SAP calculations for both the base case and the '8% home case' are required.

Guidance

1. If a dwelling contains more than one type of heating and hot water system calculate the average NO_x emissions for that house type according to *Supplementary Guidance A*.

2. NO_x emissions are based on the British Standards BS EN 297: 1994, and credits are awarded according to this classification and are measured as dry NO_x (at 0% excess O_2). Where figures supplied are other than dry NO_x, see *Supplementary Guidance C.*

3. The emissions should be estimated under normal operating conditions (not standby).

4. The NO_x levels and standards principally apply to natural gas boilers, but other fuels may meet the standards (See *Special Cases* below).

5. For standard boilers, the NO_x information will be available from the manufacturer.

6. Where the heat load (i.e. heating and hot water) for a super insulated/ exemplar home is 8% of the heat load for a Building Regulations compliant building of the same size and type, 1 credit can be awarded regardless of the primary fuel used. 2 credits if this figure is 6% and 3 credits if it is 3%. SAP sheets/ calculations need to be provided for both the base case and the super insulated/ exemplar case.

7. Other heating sources – such as open flue installations, secondary heating, electricity, CHP, heat pumps, renewables and wood – have additional guidance in *Special Cases.*

8. If air conditioning is present this has to be taken into account, provided it accounts for more than 15% of the total energy demand.

Flats

9. There is no specific guidance for flats/apartments. The standard approach should be followed.

Refurbishment

10. There is no specific guidance for refurbishment. The standard approach should be followed.

Special Cases

11. Open flue installations.

    Credits will not be awarded where open flue installations are specified, except where they are a secondary heating source as defined below. In open flue installations, low NO_x boilers can emit levels of carbon monoxide (CO), which can cause serious health risks.

12. Secondary/supplementary heating/hot water.

Information on the NO_x emissions is not required , provided the secondary heating supplies less than 8% of total heat and hot water demand in any dwelling. (The split may be calculated from the SAP worksheet, which details energy from the primary [main] and secondary heating systems and hot water. Any system classified as a secondary heating system under SAP will also be classified as a secondary heating system under this credit)

13. Electricity.

    The source of the electricity needs to be considered. If it is sourced from the national grid, the emissions are approximately 1200mg/kWh, and it is therefore unlikely that a development with a significant proportion of electric heating will meet the requirements. A commitment to use a Green Tariff to supply electricity to heat the dwellings is not sufficient to comply with this credit. Use of local or on site dedicated renewable electricity is acceptable however.

14. CHP

    The developer must provide information on the NO_x emissions from the CHP plant. Only the heat-related emissions should be considered, and specific calculation will be carried out by the assessor. See *Supplementary Guidance B,C & D*.

15. District heating systems.

    The developer must provide information on the NOx emissions from the system. Systems that incinerate waste usually have NO_x emission rates higher than the levels set to achieve any EcoHomes credits.

16. Zero Emission Energy source/s:

    Three credits can be awarded where all heat and hot water is supplied by a local zero emission renewable energy source, e.g. photovoltaics, wind power (see *Pollution 4 – Renewable and Low Emission Energy Source* for full details of acceptable zero emission energy sources) For these energy sources there are no resulting emissions including NOx. Details must be supplied.

17. Low emissions energy source/s:

    For systems such as biomass/ wood burning information on the NOx emissions must be provided. Even though the emission levels are likely to be low, they are not zero and will vary depending on system and fuel type.

18. Heat pumps

    If the electricity required to run the heat pump is less than 8% of the electricity that would have been required should the home not have had the heat pump system, 1 credit can be awarded. 2 credits if this figure is 6% and 3 credits if it is 3%. SAP calculations for both the heat pump case and the non heat pump case must be provided.

    Where electricity for heat pumps is provided from a local zero emission renewable source such as PV's, wind etc., there are no resulting emissions. This source of heating can therefore also be counted as having zero NO_x emissions and 3 credits can be awarded.

For any other system, or for clarification on how to estimate the NO_x emission, please contact BRE.

Supplementary Guidance

A: Calculating the average NO_X emissions for house types with more than one heating/hot water system

Where heat and hot water is provided by more than one system in a dwelling (i.e. there is a 'main' and 'secondary' systems) it may be necessary to calculate the total NO_X emissions for the combined systems. This is necessary when the secondary system satisfies more than 8% of a the dwelling's combined total heating and hot water demand. The calculation procedure is detailed below in Table 1:

As for the calculation of credit Ene 1, refer to the SAP worksheet for the water heating and space heating demand for each house type. This is usually given in GJ and will need to be converted to kWh.

Table 1: Calculation of average NO_x emission for a dwelling type.

Dwelling Type:								
		Heating and Hot Water Demand kWh/year (from SAP)			NOx Emission rate for Each System (mg/kWh)		Total NOx Emission per System (mg)	
Water Heating	[1]		(51)	x	[4]	=	[7]	
Space Heating (Primary)	[2]		(85)	x	[5]	=	[8]	
Space Heating (Secondary)	[3]		(85a)	x	[6]	=	[9]	
Total Energy Demand (kWh)	[10]							
Total NOx emissions (mg) for Dwelling Type					[7]+[8]+[9]	=	[11]	
Average NOx Emissions (mg/kWh) for Dwelling Type					[11] ÷ [10]	=	[18]	

Numbers in square brackets [ ] are the box reference numbers
Numbers in ordinary ( ) brackets are the SAP table reference boxes

B: Calculation Method for Combined Heat and Power (CHP).

Where **CHP** systems are present or specified, only the heat-related emissions should be considered. The NO_x emissions should be allocated to heat and power in line with their respective power outputs and the heating component only compared to the credit scale. The following formula should be used to determine this:

Heat related NO_x emissions = (A/B) x N

Where:

A = heat output (kWh)
B = total output (kWh) i.e. heat and power outputs
N = total NO_x emissions (mg/kWh) – system manufacturer to provide information. (Where data is provided in different units, or at a level of excess oxygen above zero, the manufacturer should be asked to convert

this to comply with the EcoHomes requirements, alternatively the assessor may correct these using the factors below)

Where a CHP system has been sized on the power demand, rather than the heat demand (i.e. where 'waste heat' from a community power generation system is used to meet part of the demand) additional heating systems will often be required and the method outlined under *Supplementary Guidance A* above should be used to calculate the average NO_x emissions.

C: Conversion Factors

Manufacturers should be asked to supply dry NO_x emissions data in mg/kWh. Where this is not possible the assessor may use the following conversion factors to convert figures in mg/m^3, ppm or wet NO_x. It should be noted that these conversion factors assume worst-case efficiencies and are likely to give conservative answer**.** This could have the effect of lowering the number of credits achieved.

- Figures in **mg/m^3** should be multiplied by 0.857 in order to gain emissions in mg/kWh. A conversion may also be necessary for data not calculated at 0% excess oxygen (see below).
- Figures in **parts per million (ppm)** should be multiplied by 1.76 in order to obtain mg/kWh. A conversion may also be necessary for data not calculated at 0% excess oxygen (see below).
- The EcoHomes criteria is based on dry NO_x values – almost all manufacturers will quote emissions in dry NO_x. However if **wet NO_x** figures are supplied, these should be converted to dry NO_x. This can be done by multiplying the wet NO_x figure by 1.75.

D: Excess Oxygen Correction

If a NO_x emission rate is quoted by the manufacturer in mg/m^3 or ppm, then it should be established at what % oxygen this emission was made.

The greater the amount of excess oxygen in the flue gases at the time of measurement, the more 'diluted' the NO_x. It is therefore important to convert any emission rate back to 0% excess oxygen. For the purpose of EcoHomes, use the following conversion factors for the most frequently used rates supplied by manufacturers:

% excess O_2	Conversion (c)
3%	x 1.17
6%	x 1.40
15%	x 3.54

Conversion factor c = 20.9 / (20.9 – x)

where x = % excess O2 (NOT excess air) and 20.9 is the percentage of O_2 in the air.

Further Information

Sedbuk database
Has all domestic boiler and quotes efficiencies, but does not include the NO_x levels: www.sedbuk.com

British Standards

www.bsi.co.uk

Action Energy and energy advice and Government energy programme
Replaces the Best Practice Programme: www.actionenergy.org.uk

Background

Nitrous oxides (NO_x) are emitted from the burning of fossil fuels and contribute to both acid rain and to global warming in the upper atmosphere. At ground level, they react to form ozone, a serious pollutant and irritant at low level.

Burners in domestic heating systems are a significant source of low-level NO_x, while power stations (and therefore electric heating) are a significant source of NO_x in the upper atmosphere. Whereas CO_2 is produced simply in proportion to quantity of gas burned, the amount of NO_x emissions varies from product to product. This credit rewards developers who include low-NO_x boilers or other low NO_x systems, such as renewables, in their schemes.

References

British Standards EN 297:1994. A1:1995, A2:1996, A3:1996, A5:1998 and A6:2003 *Gas-fired central heating boilers,* page 42, table 14, section 3.6.2

Pol 3 Reduction of Surface Runoff

Credits available: 2

Aim

To reduce and delay water run-off from the hard surfaces of a housing development to public sewers and watercourses, thus reducing the risk of localised flooding, pollution and other environmental damage.

Credit Requirements

The development must meet the following criteria.

Credits	
	Where rainwater holding facilities and/ or sustainable drainage techniques are used to provide attenuation of water run-off to either natural watercourses and/or municipal drainage systems, by 50%* in areas of low probability of flooding, 75%* in areas of medium flood risk and 100%* in areas of high flood risk, at peak times from:
1	• **Hard Surfaces**
1	• **Roofs**

* Where a statutory body requires a greater attenuation then the higher requirement should be met in order to achieve these credits.

Applicability

The same approach is taken for both new build and refurbishment.

ALL dwellings throughout the development must meet the requirements.

Main Information to be Provided by the Developer

1. Specifications must state the aim, location and details of any run-off attenuation devices sufficient to meet the *Credit Requirements* and the *Guidance* below.
2. The appropriate drawings should show the location and details of any run-off attenuation devices sufficient to meet the *Credit Requirements* and the *Guidance* below.
3. Design team calculations relevant to the credit Including:
   - The type and storage volume (l) of the attenuation measures.
   - Total area of hard surfaces (m^2), the peak flow rate (l/s) and the rainfall intensity of the design storm event.
4. Written confirmation of advice and approval from the relevant statutory body for the attenuation facilities specified.

Guidance

1. If the details are stated in the specification, they should also be on the drawings.

- Relevant drawings would be the site layout, drainage or similar, where the location and layout is shown and attenuation is stated.

2. The level of attenuation required will vary depending on where (in which flood risk area) the development is being built (see Pol 5 – Flood Risk *Supplementary Guidance A: United Kingdom Flood risk areas*)

   - Where the assessed development is situated in an area (flood zone) that is defined as having a **low annual probability of flooding**, rainwater holding facilities and/ or sustainable drainage techniques need to be able to attenuate at least **50%** of the peak flow during a design storm event.

   - Where the assessed development is situated in an area (flood zone) that is defined as having a **medium annual probability of flooding**, rainwater holding facilities and/ or sustainable drainage techniques need to be able to attenuate at least **75%** of the peak flow during a design storm event.

   - Where the assessed development is situated in an area (flood zone) that is defined as having a **high annual probability of flooding**, rainwater holding facilities and/ or sustainable drainage techniques need to be able to attenuate **100%** of the peak flow during a design storm event.

3. Note where the local authority (or other statutory body) requires a greater attenuation than the percentages above, and/or a more onerous design flooding frequency than that recommended in BS EN752-4, then the higher requirements must be met in order to achieve the credit.

4. The requirements for water run-off attenuation in a flood zone defined as having a high annual probability of flooding can be reduced by 25% to 75%, where the site was previously occupied by buildings or hard surfaces. The easing of the requirements in such cases is to recognise the benefit of not locating the development on an undeveloped site in a zone with a high annual probability of flooding, and therefore not contributing further to the flooding risk in such zones.

5. The credits can be awarded where the following are provided, subject to them meeting the full criteria and other guidance:

   - Permeable paving (in areas where local geological and hydrological conditions allow this to function), e.g. block paved surface on permeable sub-base over gravel bed to store the water and allow it to seep in to the soil (in less-permeable soil the gravel layer might be deeper and water flows through a soakaway)

   - Local or centralised soakaways (in areas where local geological and hydrological conditions allow them to function)

   - Holding ponds, swales, reed bends etc, provided that run-off from vehicular areas and other areas subject to potential pollution risks are covered by appropriate pollution-control measures such as interceptors, etc. Specialist advice should be sought from the local authority and/ or Environment Agency or other statutory body on what is appropriate in such instances.

   - Run-off from roofs is collected as a part of a rainwater harvesting system (see additional guidance on water butts below.)

   - Run-off from roofs is directed to a local soakaway or other holding facility such as tanks, ponds, swales etc.

- Green roofs. Note: For soil based grass roofs, calculation should be made on the basis of the infiltration, moisture retention and depth of soil. For sedum roofs, infiltration data should be provided by the manufacturer/installer.

6. External hard surfaces.

   These include:

   - all drives and other surfaces with vehicular access
   - communal car parking
   - patio areas, pathways and other hard surfaces.

   These do NOT include:

   - site distribution roads and associated pavements
   - footpaths less than 1.5m wide that have free drainage to soft landscaping areas on both sides.

7. The assessor should check that the calculations for the attenuation device, provided by the design team, comply with the requirements i.e .if the attenuation device will be able to attenuate (hold) 50, 75 or 100% of a peak flow (see *Supplementary Guidance A: Establishment of Storage Volume*). Information provided by the developer/ design team should include the following:
   - Type and specification for holding facilities/ soakaways.
   - The area of hard surfaces and roofs.
   - Design storm and/ or flooding frequency (refer to BS EN 752-4, Section 11-Table 1 or statutory body requirements if they require a more onerous design flooding frequency.). The frequency is depending on the size of the development and the area.
   - The design rainfall for the site (calculated for prescribed storm and/ or flooding frequency for 60 min peak rainfalls, unless otherwise required by a statutory body).
   - Calculations for the peak flow (run-off) rates (refer to BS EN 752-4 for hard surfaces and BS EN 12056-3 for roof run-off).
   - Calculations for the storage volume of the holding facility/ soakaway. The storage volume of the soak-away must be at least 50, 75 or 100% - depending on flood risk area - of the volume of a peak storm (rainfall) with a duration of 60 minutes (unless otherwise required by a statutory body).
   - Where soakaways or other such systems are proposed, the developer must provide evidence that advice and approval has been obtained from the relevant statutory body. Local geological or hydrological conditions can dictate the type(s) of system that may be used. See *Supplementary Guidance B*.

8. Note that the assessor is **not** required to perform any calculation as this should be provided by the design team. However, BS EN 752-4 and BS EN 12056-3 contain guidance on calculating the peak flow rate and determining the design flooding frequency should this information be required.

9. To ensure effective operation of the water run-off attenuation measures, the facilities must discharge half their volume within 24-48 hours (unless advised otherwise by a statutory body) of the storm event in readiness for any subsequent storm inflow.

10. If all run off is discharged directly from the site to either the sea, estuaries covered by a shoreline management plan or designated wildlife/SSSI areas (as part of habitat management), then the credit may be awarded without the need to specify additional attenuation measures.

11. Run-off from roofs to water butts **does not** automatically comply with the requirements of this credit, as water use is dependent on the occupier and excess water is normally discharged direct to drainage systems. Where such excess is then stored in such a manner as to meet the requirements, this credit can be awarded.
12. None of the credits can be awarded where the assessed development has proceeded against the recommendation of the relevant Flood Defence Agency on the basis that the flooding implications are too great.

Flats

13. There is no specific guidance for flats/apartments. The standard approach should be followed.

Refurbishment

14. There is no specific guidance for refurbishment. The standard approach should be followed.

Special Cases

There are currently none for this issue.

Supplementary Guidance

A: Establishment of Storage Volume

The assessor should first establish if soakaways, porous surfaces to car parking and road/pedestrian circulation areas, or water run-off holding facilities such as tanks and ponds have been specified, or are present on the site.

In cases where such facilities are specified, the Design Team will have carried out their own sizing calculations. The Assessor should ask for a copy of these to determine whether the target of 50%, 75% or 100% reduction of peak run-off will be achieved.

When determining whether the specified facilities meet the required target, the Assessor should establish the potential impermeable surface area (m^2) for the site (i.e. building area and 'hard' surfaces areas such as car parking and paths). Using the design rainfall for the site and the surface areas, the storage volumes should be checked.

The storage volume of the soakaway must be 50, 75 or 100% or more of the volume of the rainfall for peak rainfall levels.

B: Soakaway design

Local geological or hydrological conditions can prevent soakaways or other such systems relying on natural ground absorption from working. There needs to be a geotextile wrap around soakaways and land drains to prevent clogging with mobile sediment and reduce the resulting possibility of localised flooding, which may kill the surrounding planting. The backfill needs to be inert and unlikely to affect soil-water chemistry that can harm planting (e.g. no limestone).

Further Information

The Met Office (incl. figures for UK rainfall)
www.met-office.gov.uk

British Standards Online
http://bsonline.techindex.co.uk/

The Environment Agency
www.environment-agency.gov.uk/

CIRIA
Source control using constructed pervious surfaces (CIRIA publication C582)

Defra
www.defra.gov.uk

Background

Around 5 million people, (i.e. 2 million properties), live in flood risk areas in England and Wales. Excessive surface run-off can cause significant flash flooding problems to natural watercourses, rivers and municipal systems. The need to cater for such peak run-off means that systems are sized accordingly and are oversized for most of the year.

On many sites it should be possible to include holding facilities to delay the release of storm water from the site and statutory authorities may require this in certain sensitive areas, usually where natural watercourses are affected.

The main intention of this credit is to reduce the overall surface run-off of rainwater from hard landscaped surfaces and roofs within the development. In housing developments this can done either by specifying porous paving for all hard surfaces in the development, or by the adoption of soakaways or other systems (including green roofs) that reduce peak run-off loads.

Porous paving will allow water to soak through the paving into natural water tables rather than direct collected rainwater into public sewers and watercourses. Care needs to be taken to ensure that the local conditions will permit a soakaway to function adequately, and advice should be sought from the relevant statutory body to confirm this. Conventional hard landscaping can be specified in conjunction with systems that direct all collected rainwater into holding ponds or tanks. Some porous paving systems specifically designed for parking areas, collect the water and pass it through an interceptor or constructed wetland before it is returned to the natural drainage system.

References

CIRIA. – *C523 – Sustainable urban drainage systems – best practice manual for England, Scotland, Wales and Northern Ireland* (2001)

BS EN 752-4 – *Drain and sewer systems outside buildings – Hydraulic design and environmental considerations* (1998)

BS EN 12056-3 – *Gravity drainage inside buildings – Roof drainage, layout and calculations* (2000)

BRE Digest 365 - *Soakaway design* (1991)

Pol 4 Renewable and Low Emission Energy Source

Credits available: 3

Aim

To reduce atmospheric pollution by encouraging locally generated renewable and low emission energy to supply a significant proportion of the development's energy demand.

Credit Requirements

The development should meet the following criteria.

Credits	
1	Where evidence provided demonstrates that a feasibility study considering renewable and low emission energy has been carried out and the results implemented.
2	Where evidence provided demonstrates that the first credit has been achieved and 10% of total energy demand for the development is supplied from local renewable, or low emission energy, sources*
3	Where evidence provided demonstrates that the first credit has been achieved and 15% of total energy demand for the development is supplied from local renewable, or low emission energy, sources*.

* In line with the recommendations of the feasibility study.

Applicability

The same approach is taken for both new build and refurbishment.

ALL dwellings, throughout the development, should be included in the calculation of the heat (space and hot water) demand or the electricity consumption.

Main Information to be Provided by the Developer

1. SAP worksheets for each house type (from accredited SAP assessor).
2. The appropriate drawings and/ or specification should show the type of renewable source/s location and details sufficient to meet the *Credit Requirement* and the *Guidance* below.
3. Manufacturer's details, or similar, about the renewable or low emission energy system stating estimated heat or electricity output.
4. Calculations showing the anticipated annual energy production from any renewable sources.
5. Confirmation that a feasibility has been carried out.

Guidance

1. Total energy demand include energy demand for heating and hot water as well as the electrical demand (pumps and fans and lights and appliances).

2. Feasibility study.

   The developer must confirm that a feasibility study has been commissioned/undertaken to establish the most appropriate renewable or low emission energy source for the building/development. This study must cover as a minimum:

   - Payback
   - Land use
   - Local planning requirements
   - Noise
   - Whole life cost/ life cycle impact of the potential specification in terms of carbon emissions
   - Any available grants
   - All technologies appropriate to the site and energy demand of the development.
   - Reasons for excluding other technologies.

   The developer must **also** confirm that a renewable and/or low emission energy technology has been specified for the development in line with the recommendations of the above feasibility study.

   Note that the feasibility study should be carried out at outline proposal (RIBA stage C). Where the feasibility study has been carried out at other stages please contact BRE for advice.

3. Note that in order to achieve the second and third credit the first credit must be achieved and a local renewable and/or low emission energy technology implemented to provide at least 10 or 15% of the total energy demand, in line with the recommendations of the feasibility study

4. Figures used for calculations of the percentage of energy provided by renewables are based on SAP.

5. The assessor should ask for copies of calculations showing the anticipated annual energy production from any renewable or low emission energy sources and compare this with the total annual energy demand for the development as appropriate. See *Supplementary Guidance A*.

6. Electricity from a local renewable or low emission energy source that has been designed to supply the building directly, may be included in the calculations as if it were generated within the building.

7. Any electricity from a local renewable or low emission source that is exported to the grid at times of low demand in the dwelling/ development may be included in the calculation as if it was used within the dwelling/development (provided that there is a direct supply to the dwelling/ development in times of demand)..

8. Note that energy supply from remote sources such as the National Grid, will not comply, this includes electricity procured through 'green tariffs'
9. The percentage can be made up from a number of different renewable or low emission sources/ technologies.
10. 'Local' does not have to mean 'on site' and could include community schemes, however electricity should not be supplied via the National Grid in such cases.
11. Where the development under assessment forms part of a larger mixed use development and renewable generation is provided for the whole site then the amount of renewable energy counted for this credit should be proportional to the development's energy demand compared to the total energy demand for the whole site.

Flats

12. There is no specific guidance for flats/apartments. The standard approach should be followed.

Refurbishment

13. There is no specific guidance for refurbishments. The standard approach should be followed

Special Cases

There are currently none for this issue.

Supplementary Guidance

A: Calculation of percent heat (space heating and hot water) or electricity consumption contributed from renewable and zero emission energy sources.

1. Use Table 1 to calculate the heat (space and hot water) demand and non heat electrical demand for **each house type**.
2. Use Table 2 to calculate the percent contribution from Renewable and Zero Emission Energy Sources for heat and/ or electricity for the **whole development**.

Table 1: Total Energy Demand for Each House Type.

Dwelling Type:		No.of dwellings [A]:	

Space Heating and Hot Water Demand

		Heating Demand (kWh from SAP)		Totals (kWh)
Water Heating	[1]		(51)	
Space Heating (Primary)	[2]		(85)	
Space Heating (Secondary)	[3]		(85a)	
Total Space Heating and Hot Water Demand	[1]+[2]+[3] =	[4]		

Non Heating Electrical Demand

Pumps and Fans	[5]		(87)	
Lights and Appliances	[6]		(EH)	
Total Electrical Demand	[5] + [6] =	[7]		

NOTES
Figures in sqare brackets [ ] are box references for the table
Figures in parentheses ( ) are box references from the SAP sheet
(EH) calculation (box [6]) refer to the EcoHomes/ BREDEM calculations of energy for lights and appliance below.

Calculation of energy required for lights and appliances:

The energy requirement for lights and appliances, and an allowance for low energy lights (if present), must be taken into account in *Table 1*. Use the following equation for each dwelling type, and the answer is used in *Table 1 Box [12]*.

Energy for lights and appliances is:

$$E_{LA} = L_{LEF} \times TFA \quad \text{(GJ/year)}$$

Where:

E_{LA} = energy requirement for lights and appliances
L_{LEF} = Low energy light factor, and
= 0.0870 where zero low energy light fittings are fitted, or
= 0.0814 where partial low energy light fittings as in *Guidance Note 5*, or
= 0.0758 where full low energy light fittings as in *Guidance Note 5*
TFA = total floor area (m^2)

(Note: In calculating the energy reduction for low energy lights, it has been assumed that 16% of the 'lights and appliances' is lighting energy, and that low energy lighting will save 80% of that energy.)

Table 2: Percent Total Energy Demand from Renewable and Zero Emission Energy Sources for the Whole Development

Percent of total Energy Demand from Renewables and Low Emission Energy Sources for the Whole Development					
Total Space and Water Heating Demand for the **Whole Development** = Total Space and Water Heating Demand for Each House Type x Number of Units of Each House Type [A]	Σ For All House Types	([4] x [A])	=	[8]	
Non Heat Electrical Demand for **Whole Development** = Total Non Heat Electricity Demand x Number of Units of Each House Type [A]	Σ For All House Types	([7] x [A])	=	[9]	
Total Energy Demand for the whole Development (kWh)		([8]+[9])	=	[10]	
Output from Renewable Source(s) Supplying Space Heating and/or Hot Water and/or Electricity for Whole Development (kWh)				[11]	
% Total Energy Demand Supplied by Renewable Source(s) - Whole Development		([11]÷[10]) x 100	=	[12]	

B: Definition of local renewable and low emission energy sources

The following renewable/ zero emission energy technologies may be considered:

Solar
- Solar hot water – flat plate collectors or evacuated tubes
- Photovoltaics

Water

(Technologies under this heading can be considered renewable or zero emission energy where any energy used for any pumps in generated from any of the other 'renewable' sources stated here.)
- Small scale hydro power
- Tidal power
- Wave power

Wind
- Wind turbines

Other
- Fuel cells using hydrogen generated from any of the above 'renewable' sources
- Heat pumps powered by energy generated from any of the above 'renewable' sources

The following low emission energy technologies may be considered:

Biomass

(whilst in some instances this is considered carbon neutral this is not a zero emission fuel.)
- Biomass single room heaters/stoves
- Biomass boilers
- Biomass community heating

Combined Heat and Power (CHP)
- Biomass CHP

Heat Pumps

- Air source heat pumps
- Ground source heat pumps
- Water source heat pumps

For any technologies not mentioned here, please contact the BRE to ensure compliance.

Further Information

There is currently none for this issue.

Background

The use of zero emission energy sources will not only lead to reduced emissions of greenhouse gases (as assessed in Ene 1) and other pollutants, but will also help to conserve the finite global fossil fuel resources and develop a market for such technologies.

The government has set a target that 10% of energy in the UK should be generated from renewable sources by 2010. The greater the number of individual buildings that obtain 10% or more of their energy from renewable sources, the easier this target will be to achieve.

This credit rewards energy efficient design in addition to the inclusion of renewable energy technology. Supplying energy efficient buildings with 10% of their energy demand from renewable sources will be easier than for less energy efficient buildings since their total demand is lower.

References

ODPM, *Planning Policy Statement 22: Renewable Energy*, HMSO (2004)

ODPM, *Planning for Renewable Energy A companion Guide to PPS22*, HMSO (2004)

Faber Maunsell (2004) *London Renewables Toolkit*, available to download from http://www.london.gov.uk/mayor/environment/energy/renew resources.jsp,

Pol 5 Flood Risk

Credits available: 2

Aim

To encourage developments in areas with low risk of flooding or if developments are to be situated in areas with a medium risk of flooding, that appropriate measures are taken to reduce the impact in an eventual case of flooding.

Credit Requirements

The development must meet the following criteria.

Credits	
2	Where evidence provided demonstrates that the assessed development is located in a zone defined as having a low annual probability of flooding. **OR**
1	Where evidence provided demonstrates that the assessed development is located in a zone defined as having a medium annual probability of flooding and the ground level of the building, car parking and access is above the design flood level for the site's location.

Applicability

The same approach is taken for both new build and refurbishment.

ALL dwellings throughout the development must meet the requirements.

Main Information to be Provided by the Developer

1. Specifications must state the flood zone or annual probability of flooding for the site, location and details of any flood protection measures sufficient to meet the *Credit Requirements* and the *Guidance* below.

2. The appropriate drawings should show the location and details of any flood protection measures sufficient to meet the *Credit Requirements* and the *Guidance* below.

3. Written confirmation from the developers/ design team of the flood zone or annual probability of flooding in their sites location. The information must state how/where this definition/information was sourced i.e. from the Local Authority, EA or SEPA, flood maps etc.

4. Where appropriate to awarding the credit, confirmation from the developer/ design team or third party of;
    - The design flood level for the site/flood zone
    - Site plans or specification outlining the range of ground levels of the dwellings, car park and site access (lowest to highest).

Guidance

1. If the details are stated in the specification, they should also be clearly indicated on the drawings.

    - Relevant drawings would be the site layout, section or similar, where the location and layout is shown and the height above design flood level is stated.

2. Where the assessed development is situated in a flood zone that is defined as having a **medium annual probability** of flooding, the ground level of all dwellings, and access to them and the site, are designed (or zoned) so they are at least 600mm above the design flood level of the flood zone in which the assessed development is located. (see *Guidance Note 3 and 4* below)

3. It is accepted that, for dwellings located in a medium flood zone, areas of the car park and site access may be allowed to flood and therefore fall below the 600mm threshold. In such cases the credit is still achievable provided safe access to the site and the dwellings can be maintained (i.e. they are 600mm above the design flood level) to ensure the dwelling/ site does not become an 'island' in the event of a flood.

4. Where the development has been permitted and the ground levels of the topography/infrastructure immediately adjacent to the site fall below the 600mm threshold, the credit can still be awarded. Provided there are no other practical solutions for access to the site above this level and the assessed dwellings, and access to it, meet the credit requirements. As much of the external site area as possible (or as required by LA/Flood defence agency) should be designed at or above the threshold.

5. None of the credits can be awarded where the assessed development has proceeded against the recommendation of the relevant Flood Defence Agency on the basis that the flooding implications are too great.

Flats

6. There is no specific guidance for flats/apartments. The standard approach should be followed.

Refurbishment

7. There is no specific guidance for refurbishment. The standard approach should be followed.

Special Cases

There are currently none for this issue.

Supplementary Guidance

A: United Kingdom Flood zones and Probabilities of Flooding

Flood zones are defined in the relevant planning, policy and technical guidance documents for each country in the UK. PPG25 (England), TAN15 (Wales), SPP7 (Scotland), PPS15 (N. Ireland; note, currently in draft form only). PPS15 does not

categorize flood risk zones. Therefore, in the absence of a site specific assessment of annual flooding probability, assessments in N. Ireland should use the same definitions as those outlined for England (table below).

Whilst the definitions of flood zones and probabilities of flooding are generally the same throughout the UK, there are some differences. The definitions are outlined in the table below.

Definition	England	Wales	Scotland
Low annual probability of flooding	**Zone 1** Less than 1 in 1000 chance of river and sea flooding (<0.1%)	**Zone A** Considered to be at little or no risk **Zone B** If site levels are greater than the flood levels used to define adjacent extreme flood outline.	**Little or no risk area** As defined for England
Medium annual probability of flooding	**Zone 2** Between 1 in 100 and 1 in 1000 chance of river flooding (1% – 0.1%) and between a 1 in 200 and 1 in 1000 chance of sea flooding (0.5% – 0.1%).	**Zone B** If site levels are not greater than the flood levels used to define adjacent extreme flood outline. **Zone C** Equal to or greater* than 0.1% (river, tidal or coastal flooding). * For the purposes of EcoHomes assume upper probability of flooding no greater than that specified for England.	**Low to medium risk area** Watercourse, tidal or coastal flooding in the range 0.1% – 0.5% (1:1000 – 1:200).
High annual probability of flooding	**Zone 3a High Probability** 1 in 100 or greater chance of river flooding(>1%) and a 1 in 200 or greater chance of flooding from the sea (>0.5%). **Zone 3b The Functional Floodplain** Land where water has to flow or be stored in times of flood.	**Zone C1 & C2** * For the purposes of EcoHomes assume the same lower and upper probability of flooding as that specified for England.	**Medium to high risk areas** Annual probability of watercourse, tidal or coastal flooding: greater than 0.5% (1:200)

Historic rainfall data can be obtained from the Meteorological Office. Where historic rainfall series are not available, it is now possible to generate synthetic rainfall time series for locations in the UK. (refer to BS EN752-4 for more detail).

B: Glossary of terms

Design flood level: The maximum estimated water level during the design event. The design flood level for a site can be determined through either known historical data or modelled for the specific site.

Design flood event: An historic or notional flood event of a given annual flood probability, against which the suitability of a proposed development is assessed and mitigation measures, if any, are designed.

Flood Defence Agency: refers to either Environment Agency (England & Wales), The Scottish Environment Protection Agency (Scotland) and Rivers Agency (N. Ireland) and the local authorities and Internal Drainage Boards.

Flood risk: the combination of the flood probability and the magnitude of the potential consequences of the flood event.

Flood event: A flooding incident characterised by its peak level or flow, or by its level or flow hydrograph.

Flood probability: The estimated probability of a flood of given magnitude occurring or being exceeded in any specified time period.

Flood storage: The temporary storage of excess runoff or river flow in ponds, basins, reservoirs or on the flood plain during a flood event.

Shoreline Management Plan: SMP's provide a large scale assessment of the risks associated with coastal processes and presents a policy framework to reduce these risks to people and the developed, historic and natural environment in a sustainable manner.

Further Information

The Met Office (incl. figures for UK rainfall)
www.met-office.gov.uk

British Standards Online
http://bsonline.techindex.co.uk/

The Environment Agency
www.environment-agency.gov.uk/

CIRIA
Source control using constructed pervious surfaces (CIRIA publication C582)

Background

Flooding in the United Kingdom is increasing due to more extreme weather patterns brought about by global warming. Other reasons may have to do with increased run-off from hard surfaces and from some agricultural land. Coastal flooding is exacerbated by rising sea levels, also a result of global warming.

Floods are now on average nearly twice as frequent as they were one hundred years ago.

Over seven percent of the land area of England and Wales is at risk from flooding and around 5 million people, (i.e. 2 million properties), live in flood risk areas in England and Wales.

The Meteorological Office predict a very significant increase in the incidence of flooding over the next century as a result of climate change. If property development continues to increase in high-risk areas, the frequency and intensity of natural catastrophes will inevitably increase too - even if the number of natural events remains constant.

A way of expressing the flood frequency is the chance of occurrence in a given year, which is the percentage of the probability of flooding each year. For example, the 100-year flood has a 1% chance of occurring in any given year.

References

Development and flood risk, guidance for the construction industry, Lancaster et. al, CIRIA (2004).

Standards for the repair of buildings following flooding, C623, CIRIA (2005).

BRE Good Repair Guide 11, "Repairing Flood Damage" Part 1-4, CRC Ltd, (1997)

Design guidance on flood damage to dwellings, The Scottish Office (1996)

Consultation on planning policy statement 25, "Development and flood risk", ODPM (2005).

Planning Policy Wales Technical Advice Note 15, "Development and flood risk", Welsh Assembly Government (2004).

Scottish Planning Policy 7, "Planning and flooding", Scottish Executive (2004).

BS EN 752-4: 1998, *"Drain and sewer systems outside buildings – Part 4: Hydraulic design and environmental considerations"*, British Standard Institute (1998)

BS EN 12056-3: 2000, *"Gravity drainage inside buildings – Part 3: Roof drainage, layout and calculation"*,, British Standard Institute (2000)

BRE Digest 365, "Soakaway design", Building Research Establishment (1991).

www.environment-agency.gov.uk

www.defra.gov.uk