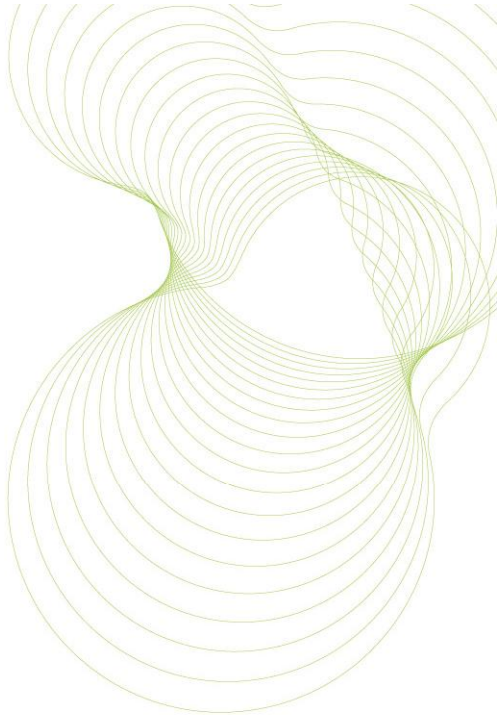


Measuring the environmental performance of construction materials:

The Green Guide to Specification – Roofing and Hard landscaping

BREEAM Materials, BRE Global

February 2009

Overview

- Sustainability context and buildings
- LCA and Environmental Profiles Methodology
- The Green Guide to Specification
- Use of the Green Guide – BREEAM and The Code
- Impacts of roofing and hard landscaping

Sustainability – Why are we here?

Construction industry and buildings

- Large impacts
  - Construction and demolition waste alone represents 32% of total UK waste (DEFRA)
  - the energy used in constructing, occupying and operating buildings represents approximately 50% of greenhouse gas emissions in the UK. (Environment Agency 2007)
  - Passenger transport vehicles account for a further 15% of CO_2 emissions. (EST)

Sustainability: How does this apply to buildings?

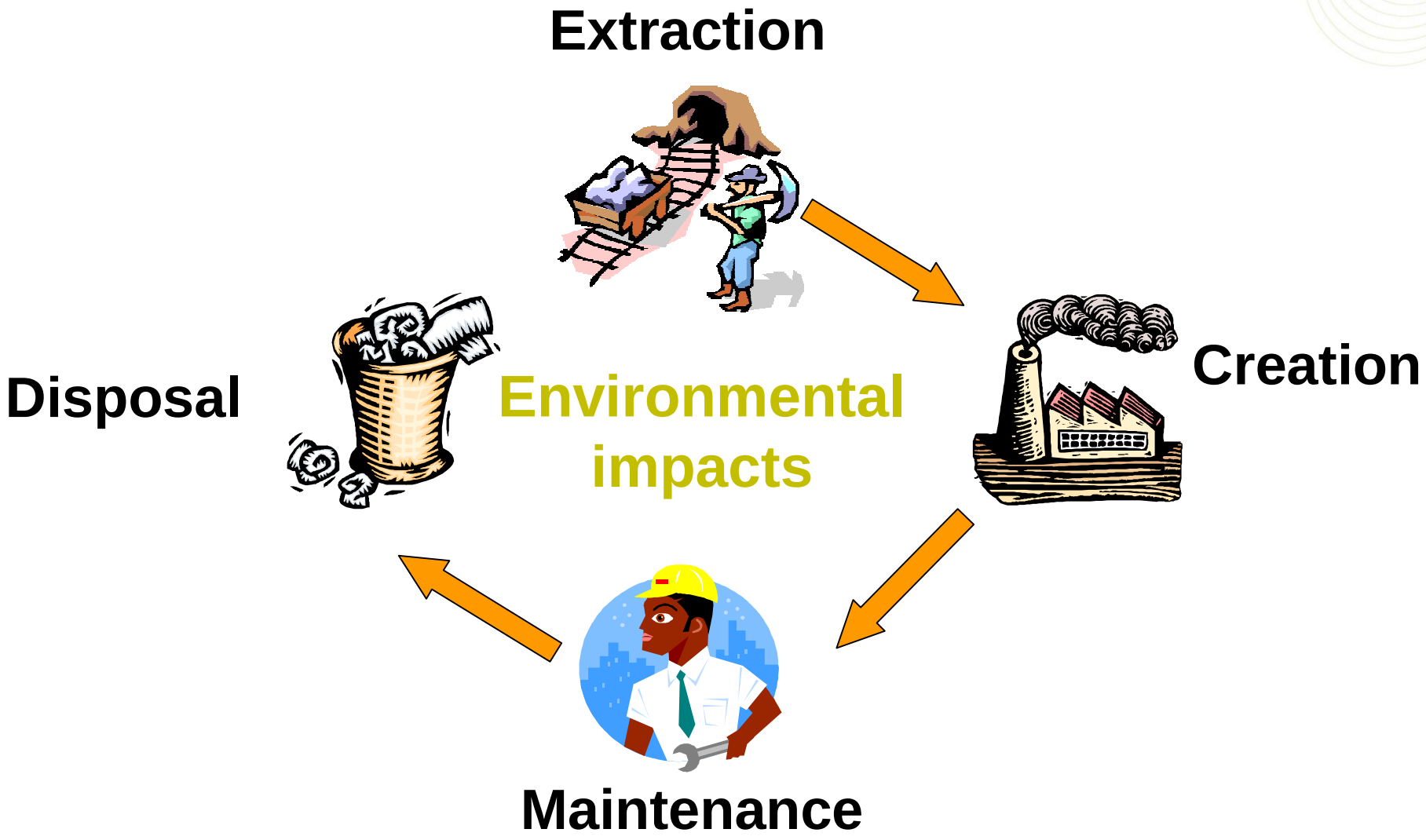
- Sustainability is a complex & political agenda
- Generally no agreed consensus
- Likely to always change depending upon context
- Lots of Greenwash
- No single tool for measuring sustainability
- Industry using many tools/methods/systems;
  - Life Cycle Assessment (LCA)
  - BREEAM
  - Code for Sustainable Homes (CSH)
  - Carbon Labelling & Footprinting
  - Whole Life Costing (WLC)
  - Environmental Product Declarations (EPD's)
  - Many others…

Looking at the product level…

How do we measure environmental performance?

Life Cycle Assessment (LCA)

Life Cycle Assessment (LCA)



How can LCA be used in the Industry?

- To measure existing performance and monitor improvements
- To assess benefits of innovative processes
- To compare materials which offer the similar functions, eg external wall constructions
- To compare building designs over their expected lifetimes
- Used in the BRE Environmental Profiles Methodology
- Applied in tools like The Green Guide to Specification

What is an Environmental Profile?

Measurement of the environmental performance of a material, product or system over a set time period.

- Extraction of raw materials & transport ("cradle to gate")
- Production ("gate to gate")
- Transport, installation and end of life ("gate to grave")

Achieved using Life Cycle Assessment (LCA)

Used in BRE 2007 Environmental Profiles Methodology

- **Level playing field for assessing construction products**

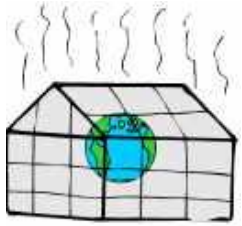
Outcome is a Type III Environmental Product Declaration (EPD) compliant with ISO 14025 (externally audited by UKAS)

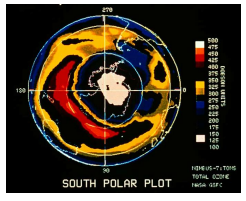
Environmental Profiles 2008 Impact categories

Environmental Issue	Weighting (%)
Climate Change	21.6
Water extraction	11.7
Mineral resource depletion	9.8
Stratospheric ozone depletion	9.1
Human toxicity	8.6
Ecotoxicity to water	8.6
Nuclear waste	8.2
Ecotoxicity to land	8.0
Waste disposal	7.7
Fossil fuel depletion	3.3
Eutrophication	3.0
Photochemical ozone creation	0.20
Acidification	0.05

Derivation of Ecopoints

Issues



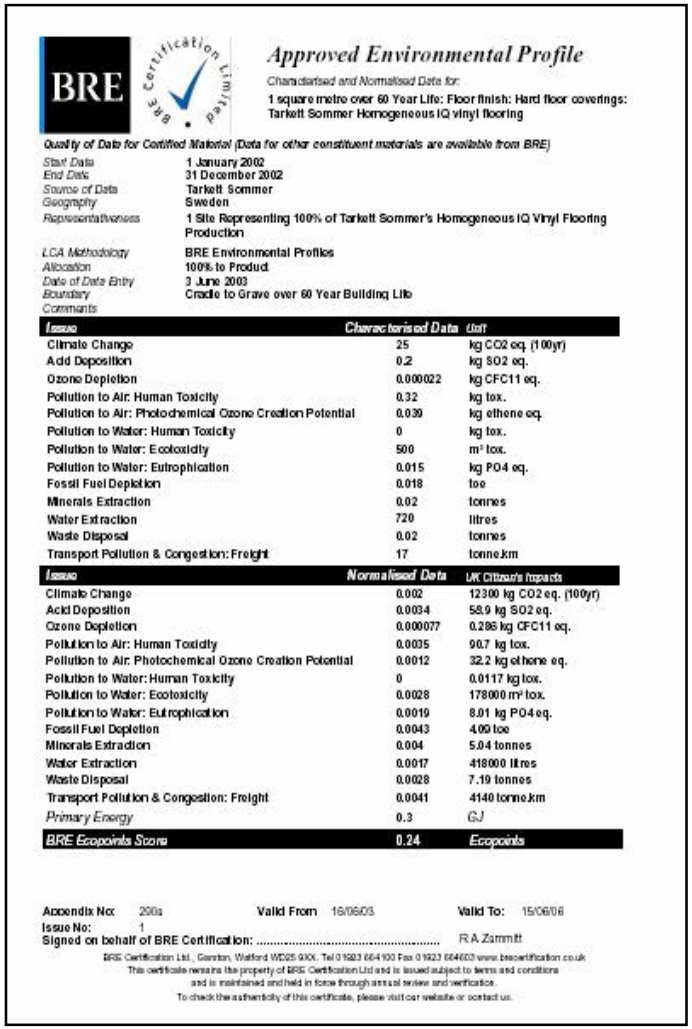


Measurement

Weighting

ECOPOINTS

The Environmental Profile – An independent product declaration



BRE Certification Limited

Approved Environmental Profile

Characterised and Normalised Data for:

1 square metre over 60 Year Life: Floor finish: Hard floor coverings: Tarkett Sommer Homogeneous IQ vinyl flooring

Quality of Data for Certified Material (Data for other constituent materials are available from BRE)

Start Date	1 January 2002
End Date	31 December 2002
Source of Data	Tarkett Sommer
Geography	Sweden
Representativeness	1 Site Representing 100% of Tarkett Sommer's Homogeneous IQ Vinyl Flooring Production
LCA Methodology	BRE Environmental Profiles
Allocation	100% to Product
Date of Data Entry	3 June 2003
Boundary	Cradle to Grave over 60 Year Building Life
Comments	

Issue	*Characterised Data*	*Unit*
Climate Change	25	kg CO2 eq. (100yr)
Acid Deposition	0.2	kg SO2 eq.
Ozone Depletion	0.000022	kg CFC11 eq.
Pollution to Air: Human Toxicity	0.32	kg tox.
Pollution to Air: Photochemical Ozone Creation Potential	0.039	kg ethene eq.
Pollution to Water: Human Toxicity	0	kg tox.
Pollution to Water: Ecotoxicity	500	m^3 tox.
Pollution to Water: Eutrophication	0.015	kg PO4 eq.
Fossil Fuel Depletion	0.018	toe
Minerals Extraction	0.02	tonnes
Water Extraction	720	litres
Waste Disposal	0.02	tonnes
Transport Pollution & Congestion: Freight	17	tonne.km

Issue	*Normalised Data*	*UK Citizen's Impacts*
Climate Change	0.002	12300 kg CO2 eq. (100yr)
Acid Deposition	0.0034	58.9 kg SO2 eq.
Ozone Depletion	0.000077	0.286 kg CFC11 eq.
Pollution to Air: Human Toxicity	0.0035	90.7 kg tox.
Pollution to Air: Photochemical Ozone Creation Potential	0.0012	32.2 kg ethene eq.
Pollution to Water: Human Toxicity	0	0.0117 kg tox.
Pollution to Water: Ecotoxicity	0.0028	178000 m^3 tox.
Pollution to Water: Eutrophication	0.0019	8.01 kg PO4 eq.
Fossil Fuel Depletion	0.0043	4.09 toe
Minerals Extraction	0.004	5.04 tonnes
Water Extraction	0.0017	418000 litres
Waste Disposal	0.0028	7.19 tonnes
Transport Pollution & Congestion: Freight	0.0041	4140 tonne.km
Primary Energy	0.3	*GJ*
BRE Ecopoints Score	**0.24**	***Ecopoints***

Appendix No: 290a **Valid From** 16/06/03 **Valid To:** 15/06/08

Issue No: 1

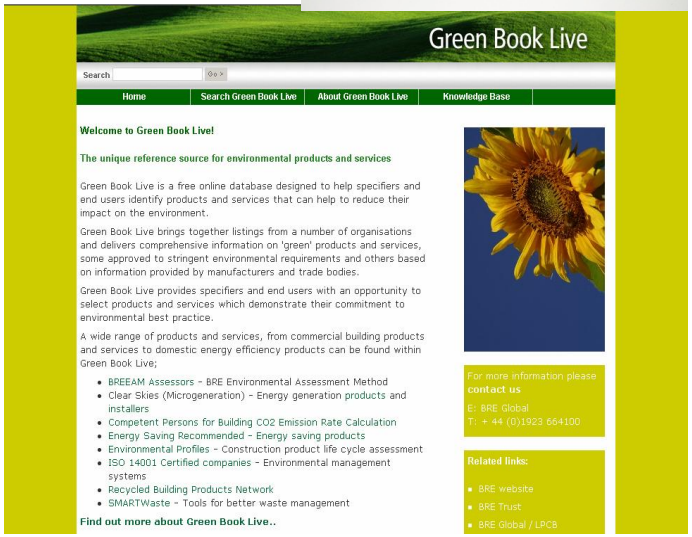
Signed on behalf of BRE Certification: ..... R A Zammit

BRE Certification Ltd., Garston, Watford WD25 9XX. Tel 01923 664100 Fax 01923 664603 www.breecertification.co.uk
This certificate remains the property of BRE Certification Ltd and is issued subject to terms and conditions and is maintained and held in force through annual review and verification.
To check the authenticity of this certificate, please visit our website or contact us.

BRE Global: Certified Environmental Profiles

- Sister company to BRE (previously BRE Certification)
- Data verification process – evidence
- Supports external claims
- Environmental Profiles valid 3 years
- An independent environmental product declaration

- Whole process revolves around:
  - Product manufacture data
  - Data verification (Factory site audit)
  - Data modelling – LCA methodology



What do you do with an Environmental Profile?

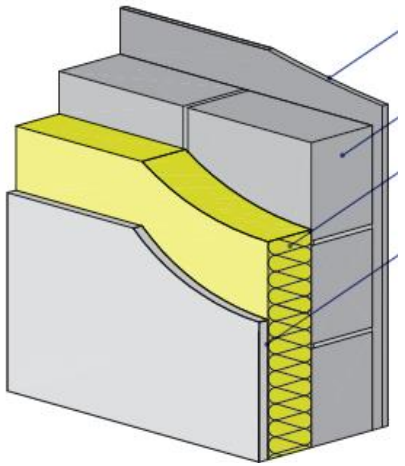
Comparison at a building element level

Bricks vs bricks

Wall specifications

vs

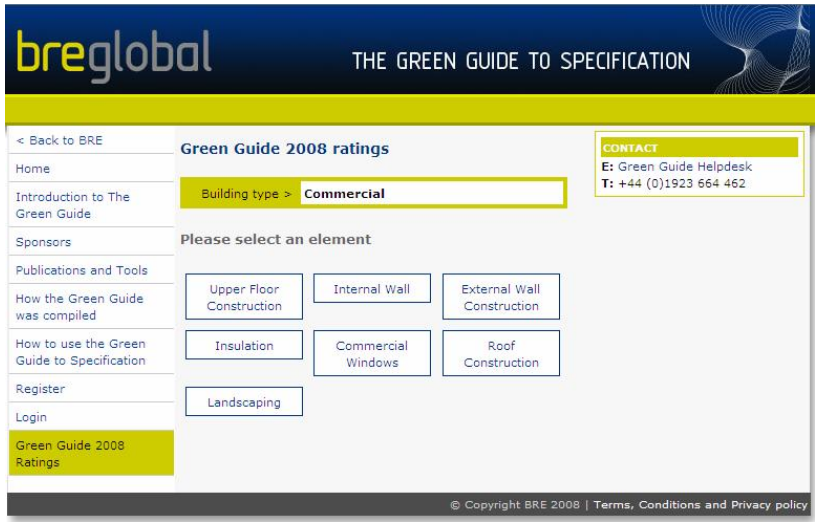
Blocks vs blocks



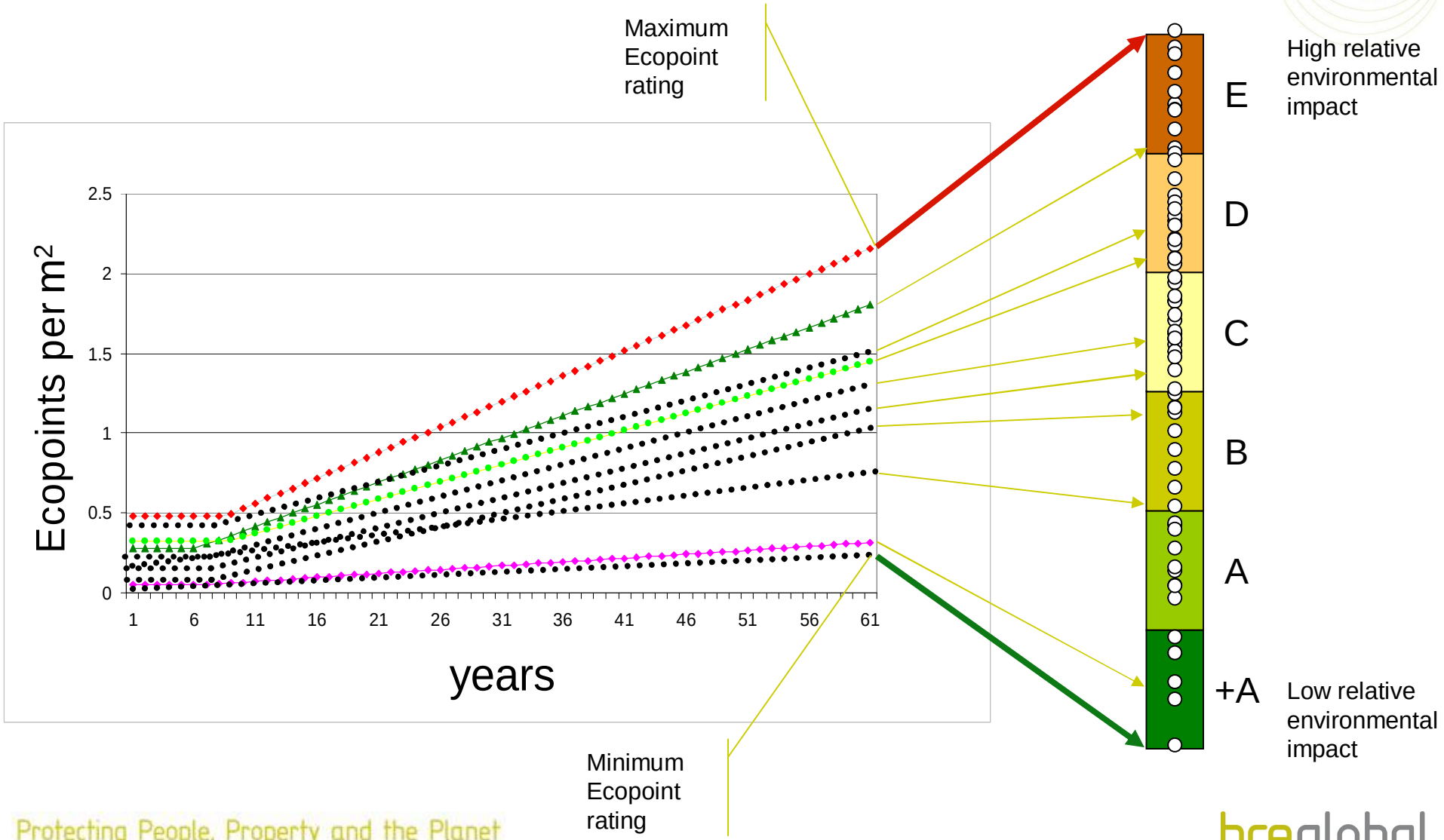
The Green Guide to Specification

- Ecopoints for building materials placed into specifications
- Environmental impacts of building elements
- Based on LCA
- A+ to E rating

www.thegreenguide.org.uk



The Ecopoint and A+ to E ratings

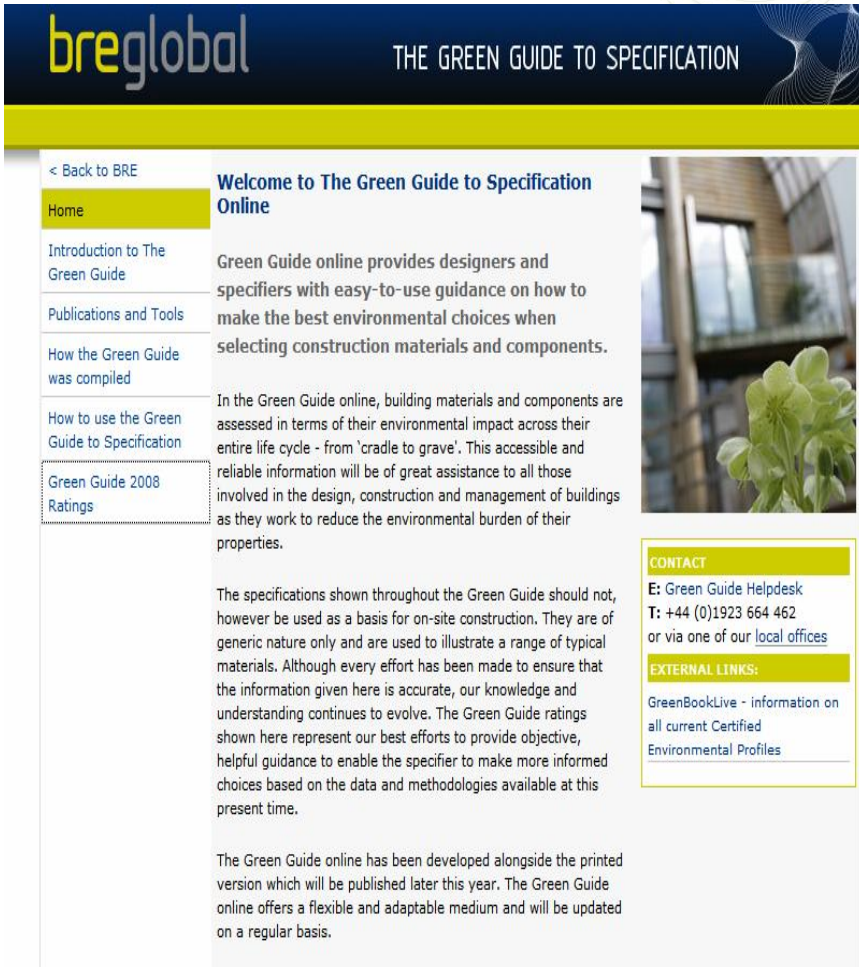


The Green Guide to Specification

- Green Guide update
  - Online & Paper publication

www.thegreenguide.org.uk

  - 1500+ generic specifications each with summary Ratings
  - Ratings A+ to E
  - 13 impact category ratings
  - Six building types
- FREE access
- Ongoing development



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Green Guide 2008 Ratings

Welcome to The Green Guide to Specification Online

Green Guide online provides designers and specifiers with easy-to-use guidance on how to make the best environmental choices when selecting construction materials and components.

In the Green Guide online, building materials and components are assessed in terms of their environmental impact across their entire life cycle - from 'cradle to grave'. This accessible and reliable information will be of great assistance to all those involved in the design, construction and management of buildings as they work to reduce the environmental burden of their properties.

The specifications shown throughout the Green Guide should not, however be used as a basis for on-site construction. They are of generic nature only and are used to illustrate a range of typical materials. Although every effort has been made to ensure that the information given here is accurate, our knowledge and understanding continues to evolve. The Green Guide ratings shown here represent our best efforts to provide objective, helpful guidance to enable the specifier to make more informed choices based on the data and methodologies available at this present time.

The Green Guide online has been developed alongside the printed version which will be published later this year. The Green Guide online offers a flexible and adaptable medium and will be updated on a regular basis.

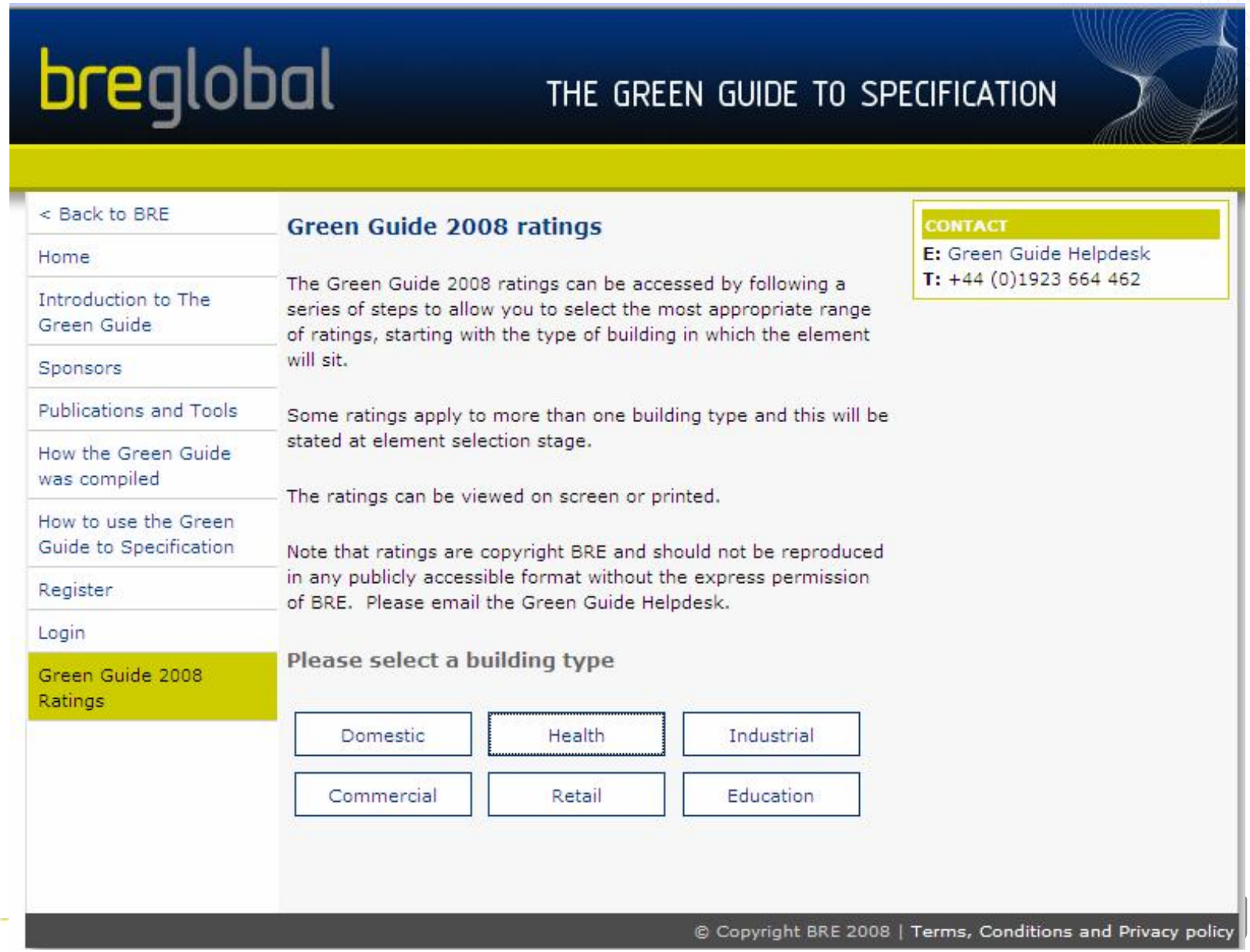
CONTACT

E: Green Guide Helpdesk
T: +44 (0)1923 664 462
or via one of our local offices

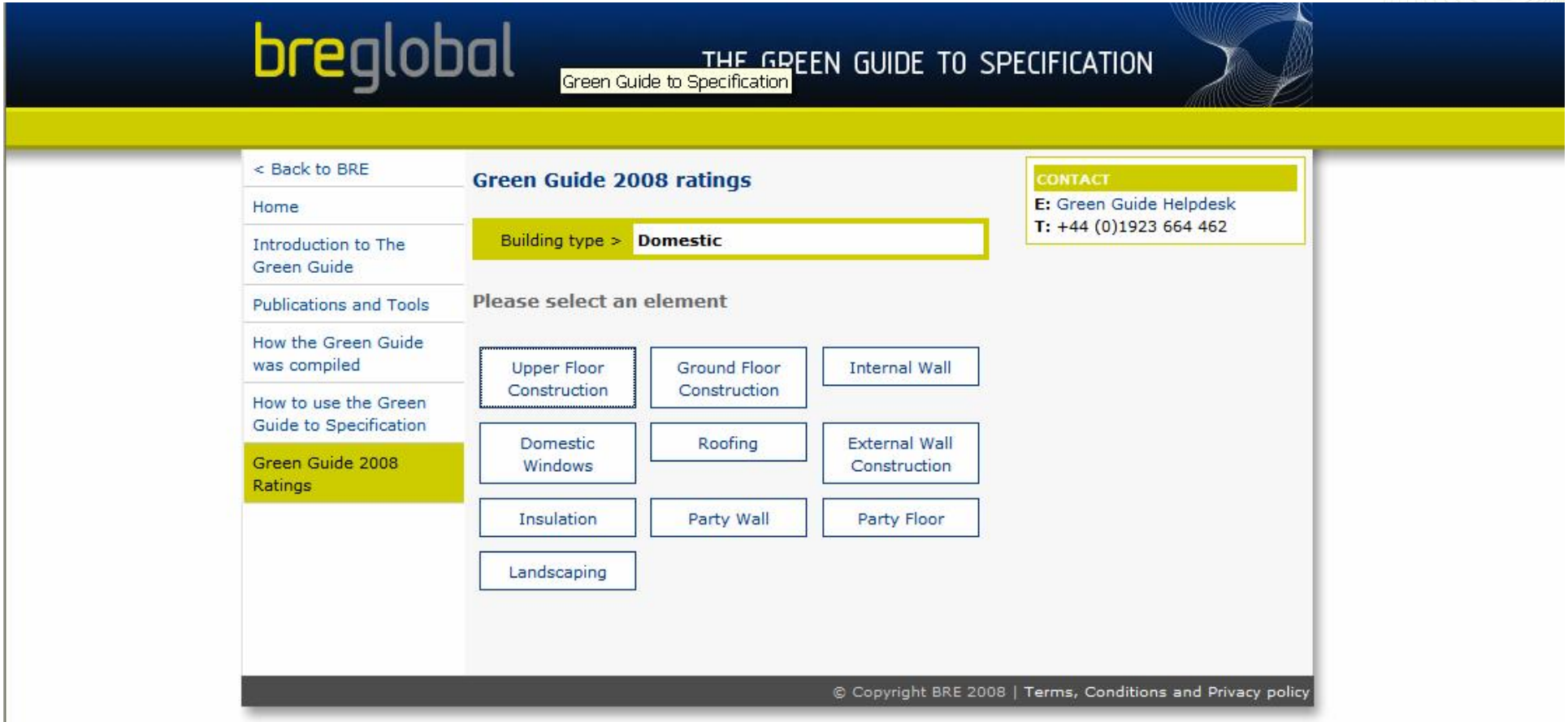
EXTERNAL LINKS:

GreenBookLive - information on all current Certified Environmental Profiles

Building Type?



Element?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Building type > Domestic
Please select an element
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Ground Floor Construction
Internal Wall
Domestic Windows
Roofing
External Wall Construction
Insulation
Party Wall
Party Floor
Landscaping
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Element details

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Green Guide 2008 ratings

Building type > **Domestic**

Category > **External Wall Construction**

External Walls

External wall ratings are the same for the following building types:
Domestic, Health, Commercial, Retail, Industrial, Education

Functional unit for External Walls:
1m² of external wall construction, to satisfy current building regulations, and a U value of 0.3 W/m²K. Where relevant, the specification will also include an internal wall finish.

Variation for retail/industrial
1m² of external wall construction, to satisfy current building regulations, and a U value of 0.3 W/m²K.

Perhaps more than any decision facing the designer, the choice of the external wall specification is subject to the widest range of practical, economic and visual considerations, some of which may be beyond the control of the design team.

External walls can have a significant contribution to the impacts of

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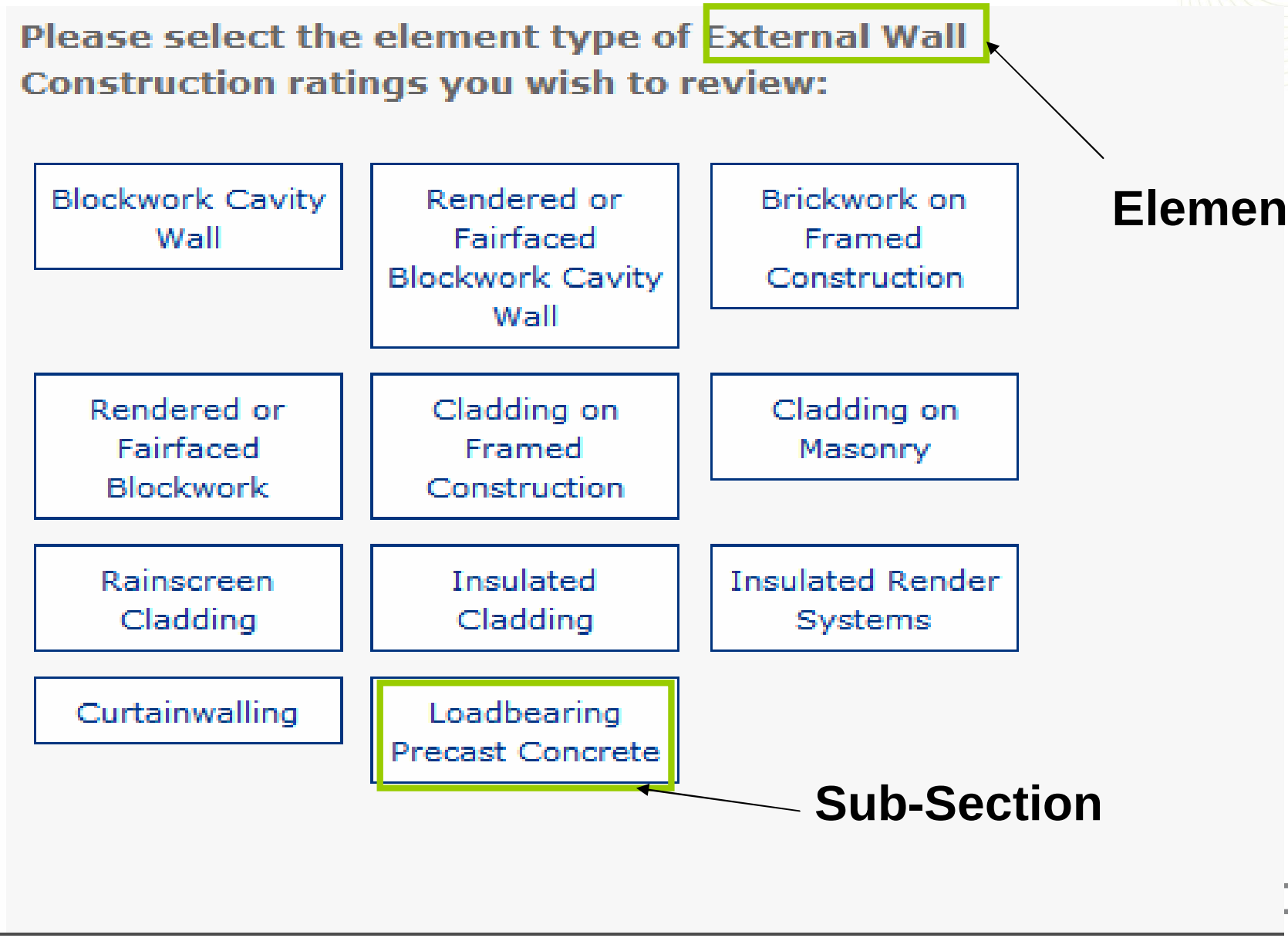
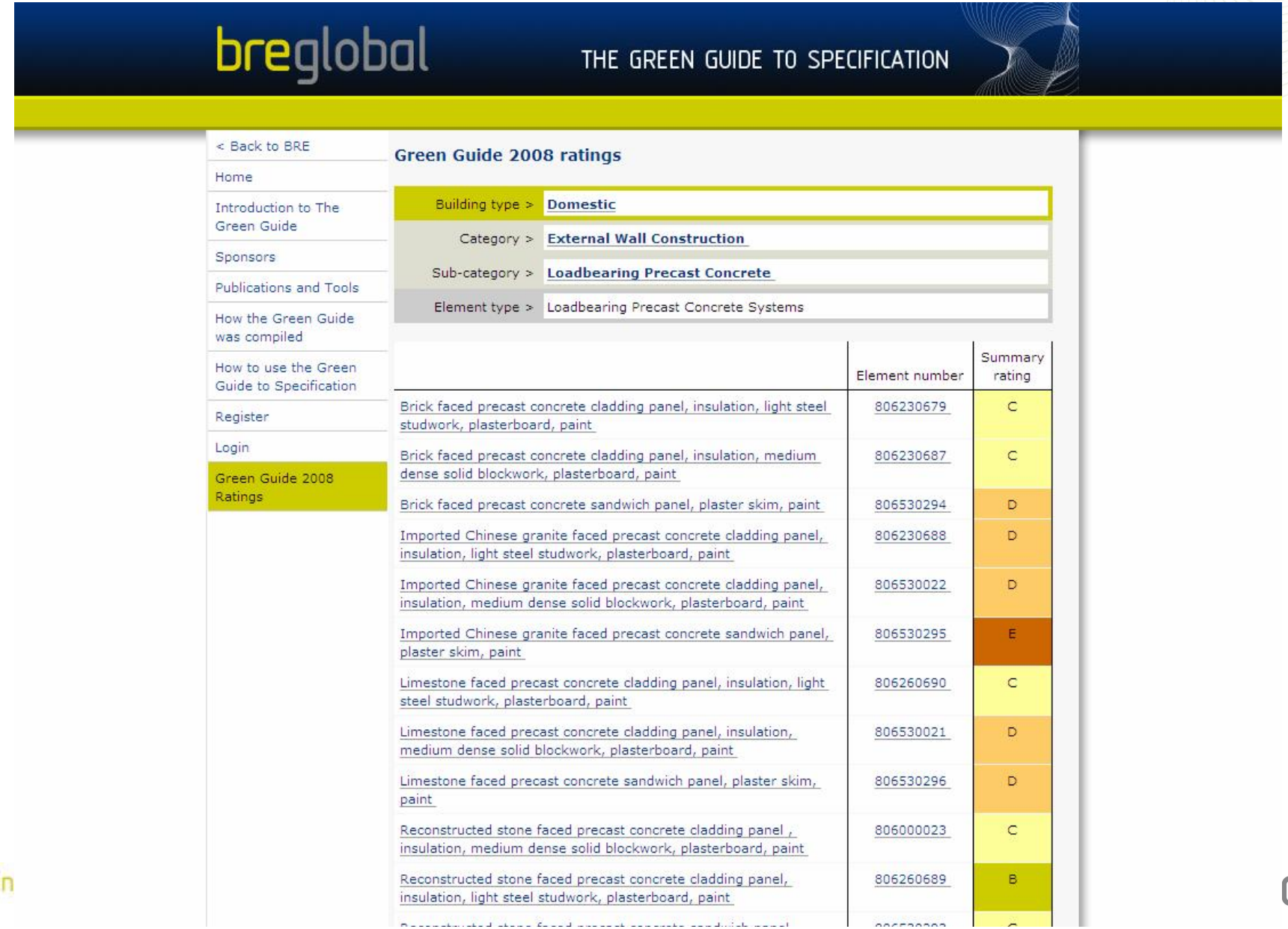
Sub-Section of Elements



Specification ratings



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Green Guide 2008 ratings

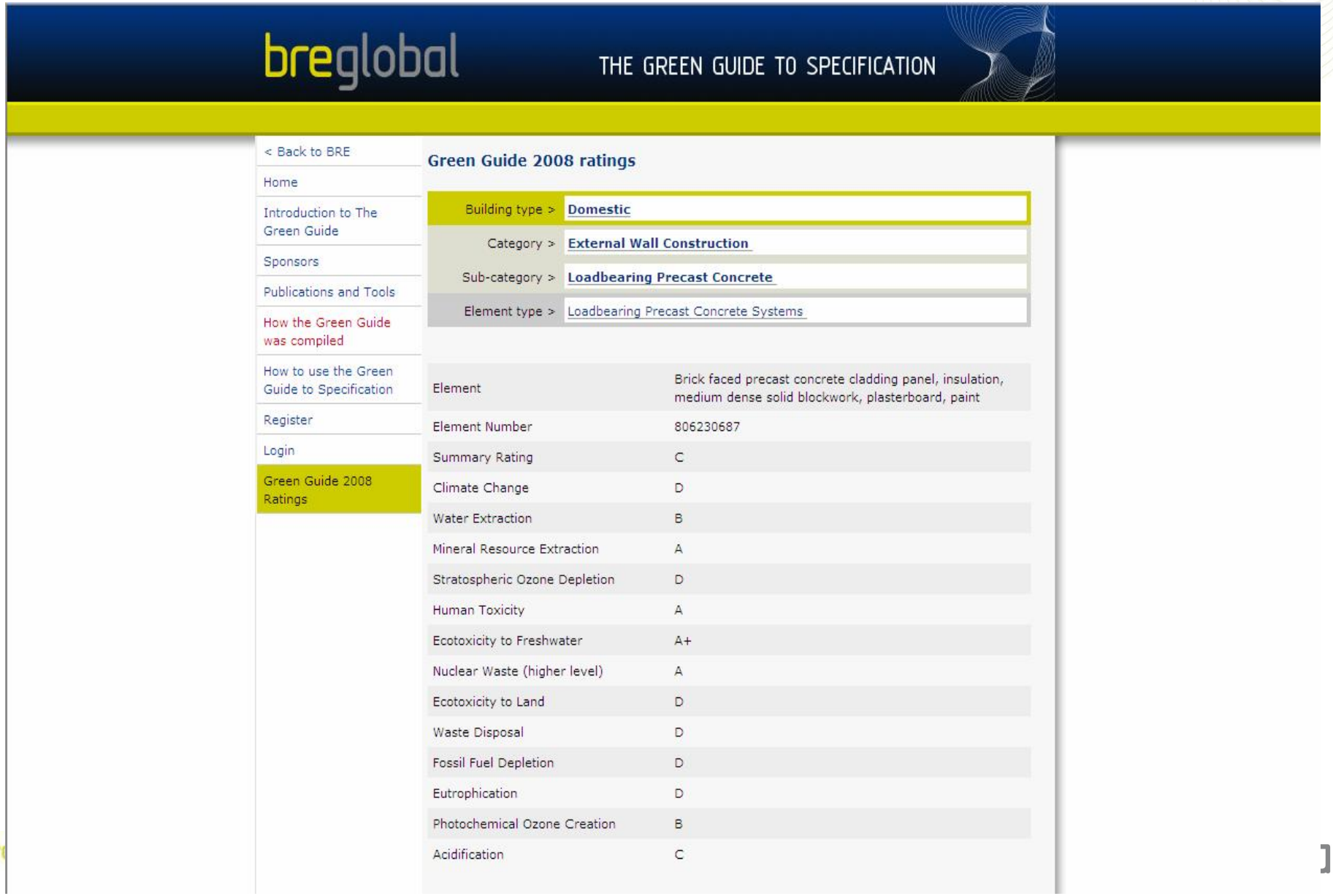
Building type >	Domestic
Category >	External Wall Construction
Sub-category >	Loadbearing Precast Concrete
Element type >	Loadbearing Precast Concrete Systems

	Element number	Summary rating
Brick faced precast concrete cladding panel, insulation, light steel studwork, plasterboard, paint	806230679	C
Brick faced precast concrete cladding panel, insulation, medium dense solid blockwork, plasterboard, paint	806230687	C
Brick faced precast concrete sandwich panel, plaster skim, paint	806530294	D
Imported Chinese granite faced precast concrete cladding panel, insulation, light steel studwork, plasterboard, paint	806230688	D
Imported Chinese granite faced precast concrete cladding panel, insulation, medium dense solid blockwork, plasterboard, paint	806530022	D
Imported Chinese granite faced precast concrete sandwich panel, plaster skim, paint	806530295	E
Limestone faced precast concrete cladding panel, insulation, light steel studwork, plasterboard, paint	806260690	C
Limestone faced precast concrete cladding panel, insulation, medium dense solid blockwork, plasterboard, paint	806530021	D
Limestone faced precast concrete sandwich panel, plaster skim, paint	806530296	D
Reconstructed stone faced precast concrete cladding panel , insulation, medium dense solid blockwork, plasterboard, paint	806000023	C
Reconstructed stone faced precast concrete cladding panel, insulation, light steel studwork, plasterboard, paint	806260689	B

Protectin

al

Summary Issue Category Ratings



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Green Guide 2008 ratings

Building type >	Domestic
Category >	External Wall Construction
Sub-category >	Loadbearing Precast Concrete
Element type >	Loadbearing Precast Concrete Systems

Element	Brick faced precast concrete cladding panel, insulation, medium dense solid blockwork, plasterboard, paint
Element Number	806230687
Summary Rating	C
Climate Change	D
Water Extraction	B
Mineral Resource Extraction	A
Stratospheric Ozone Depletion	D
Human Toxicity	A
Ecotoxicity to Freshwater	A+
Nuclear Waste (higher level)	A
Ecotoxicity to Land	D
Waste Disposal	D
Fossil Fuel Depletion	D
Eutrophication	D
Photochemical Ozone Creation	B
Acidification	C

The Use of the Green Guide to Specification

- Architects and building specifiers

- Part of BRE's Environmental Assessment Methods for buildings
  - BREEAM & EcoHomes (BRE)
  - Code for Sustainable Homes (BRE & DCLG)
  - Materials specification credits
  - www.breeam.org

breeam

Protecting People, Property and the Planet

THE CODE FOR SUSTAINABLE HOMES

breglobal

What is BREEAM?

- BRE - Environmental Assessment Method
- Voluntary Certification scheme for Buildings (but often specified as part of planning)
- Provides an environmental label for buildings
  - Pass, Good, Very Good, Excellent, Outstanding
- Independent & credible
- Holistic and Issue based – broad range of environmental concerns
- Ensures best environmental practice above regulatory minimum
- Large scope – many different types of buildings assessed
- Used mainly in UK but also growing Internationally

The Code for Sustainable Homes

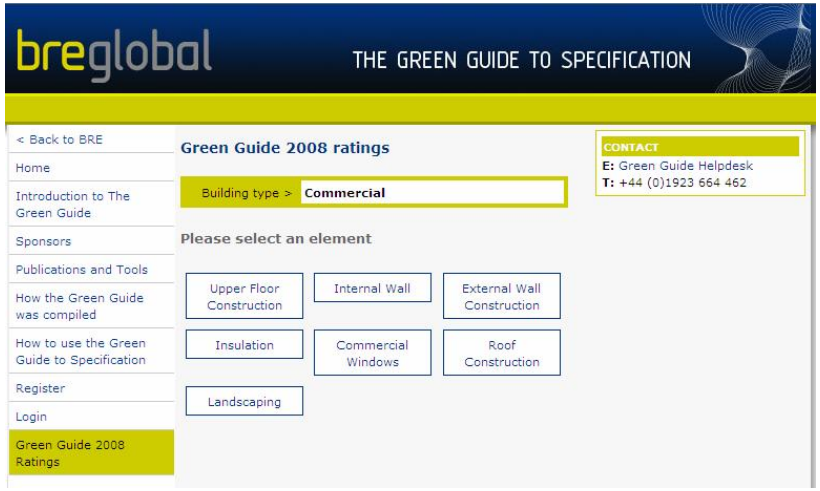
- The Sustainable Buildings Task Group (SBTG)
- Set up by DEFRA, DTI, DCLG, EA, EP and others

- Launched April 2007, revised May 2008
- A single national standard for England
- Based on BREEAM - EcoHomes
  - (replaces EcoHomes in England)

- Mandatory rating for all new homes in England (May 08) and now for Wales too!

Materials Specification

- One of the many issues assessed in BREEAM and The Code
- Credits available - variable
- Whole life environmental impact
- Key building elements assessed
- Green Guide to Specification
  - Ratings A+ to E
  - www.thegreenguide.org.uk



- Higher scores for better rated elements
- Code – Minimum D rated specifications
- Based on LCA and Environmental Profiles Methodology
- Bespoke ratings – Certified Environmental Profiles

How are Roofs and Hard landscaping assessed within BREEAM and The Code?

- Points available within the materials specification credit
  - **Roofs**
  - **Hard landscaping**

Elements assessed	Non Domestic schemes												Domestic		
	BREEAM														
	Bespoke	Offices (design)	Offices (fit out)	Retail (design)	Retail (fit out)	NEAT (NHS)	Healthcare	Prisons	Schools	Courts	Industrial	Further Education	EcoHomes (2006)	Multi-Residential	Code For Sustainable Homes
Upper Floors	Y	Y		Y		Y	Y	Y	Y	Y		Y	Y	Y	Y
Ground Floors													Y		Y
External walls	Y	Y		Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Roofs	Y	Y		Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Floor Finishes	Y		Y		Y	Y	Y		Y	Y		Y		Y	
Windows	Y	Y		Y		Y	Y		Y	Y		Y	Y	Y	Y
Internal walls/partitions	Y		Y		Y	Y	Y		Y	Y		Y	Y	Y	Y
Hard landscaping	Y	Y		Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	
Boundary protection	Y	Y		Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	

Green Guide performance for Roofs

- Roofing specifications vary by building type
- Greater impact for low rise buildings in comparison to high rise buildings
- Different specifications for Domestic, Industrial, Retail, Education and Commercial buildings
- Different ratings depending on pitch of roof and construction

Green Guide performance for Roofs

- Generally…
- Flat roof cold deck - perform well (A+)
    - *Timber structures (low climate change impact)*
- Flat roof Inverted / warm deck
    - *Timber structures - perform well (A and A+)*
    - *Beam and block, concrete, metal structures - perform poorly (B to E)*
        - various different membranes (bitumen, PVC, TPO, asphalt)
        - Paving slabs have higher impact than pebbles
        - Insitu reinforced concrete performs very poorly (mostly D and E)
- Pitched roofs
    - *Timber and steel constructions (mostly all achieve A or A+)*

Green Guide performance for Hard Landscaping

- Ratings are the same for all building types
- Different ratings dependant upon how trafficked the area is
- Generally:
  - Best performing = concrete paving flags / reclaimed clay pavers with a recycled or no sub-base
    - *Low climate change impacts*
  - Asphalt over recycled sub-base and sandstone / clay pavers perform well
    - *Low water and mineral extraction but high waste disposal*
  - Worst performing = Imported Chinese granite or imported Indian sandstone
    - *High climate change and minerals extraction impacts*

Conclusions

- Sustainability becoming increasingly important for the construction industry
- LCA and Environmental Profiles are tools for assessing environmental performance
- The Green Guide to Specification is a useful tool for architects and specifiers
- Green Guide increasingly being used in the UK due to BREEAM and The Code for Sustainable Homes

Any Questions?

Thank you

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