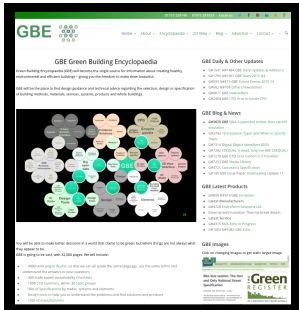


GBE

https://GreenBuildingEncyclopaedia.uk

CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

Investing in Opportunities

This project has received European Regional Development Funding through INTERREG IV B.

INTERREG IVB

Reclaimed Product Material Passports

ZWS & SEDA Circular Economy Event

24th October 2019

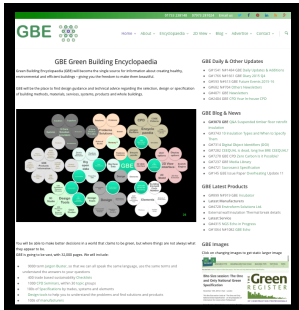
BrianSpecMan Murphy

This Presentation on GBE:

-
-
- https://GreenBuildingEcyclopaedia.uk/?P=27448
- CPD file at:
- https://GreenBuildingEcyclopaedia.uk/?P=30129

Current Doctrine

- ‘Profits Before People Before Planet’
- Fiduciary Rules Okay
  - *Obligation to make a Profit for Shareholders*
  - *At the expense of everything else?*
- ISO 26000 invented to curb excesses
  - *CSR Corporate Social Responsibility*
    - *Often Greenwash Plaster*
  - *Ethical Trading*
- Created as a guide
  - *Became a Benchmark*



GBE

https://GreenBuildingEncyclopaedia.uk

CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

Investing in Opportunities

This project has received European Regional Development Funding through INTERREG IV B.

INTERREG IVB

Sustainable Definitions

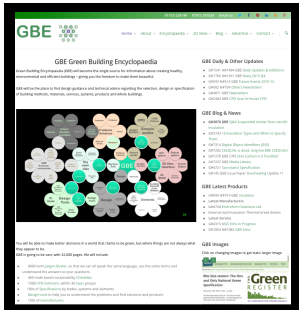
- –Sustainable = inconsistent inadequate definitions
- –Sustainable = Environmental eroded by profits

GBE Alternative Definition: for Sustainability

- Healthy Environmental Resourceful Appropriate Competent Effective or Ethical Yardstick
- = HERACEY™
- More later
  - GBE HERACEY™ (Jargon Buster) G#1429 N#1399

Constructions Demolition Excavation CDE Waste Stats:

- Pre 2004 110 m tonnes/annum in UK
  -
  -
- SWMP checklist and SWMP Regs. 2004
  -
- After red tape deregulation of SWMP Regs.
  -
- £150m/annum over-ordered, never needed



GBE

https://GreenBuildingEncyclopaedia.uk

CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

Investing in Opportunities

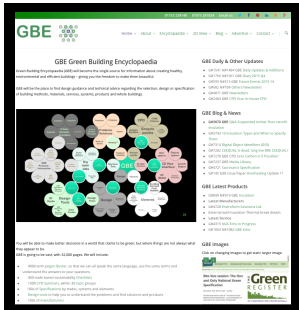
This project has received European Regional Development Funding through INTERREG IV B.

INTERREG IVB

EU Initiative

Complimentary Directives or initiatives

-
  - Blatant breaches: UK H&S and REACH have no teeth
-
  - Manipulated by stakeholders (Manufacturer Associations)
  - To make violet materials look grey or even green
-
  - Being manipulated by stakeholders to act like LCA
-
-
  - In the hands of expensive consultants
  - Or in expensive software
  - We need to make our own calculators
    -
    -



GBE

https://GreenBuildingEncyclopaedia.uk

CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

Investing in Opportunities

This project has received European Regional Development Funding through INTERREG IV B.

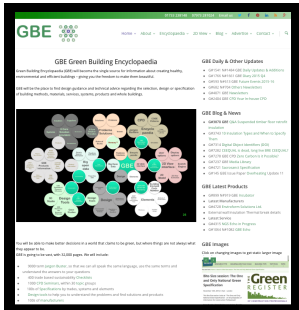
INTERREG IVB

EU Funded projects

- Horizon 2020
  -
  -
- Interreg
  -
  -
    Building Elements (current)
  -
    for Construction (just finished)

Global awareness has risen

-
-
  -
-
  -
-
  -
  - Behavioural Change campaign
    - Government, Business & Individuals
  - SchoolStrike4Climate
    - Asked the Adults to join them
      - Declare Architects
      - Declare Construction
      - Declare Education
    - Architects CAN Carbon Action Network
      - Architects Can’t, don't have the know-how
      - TGR facilitating CPD by PHT TRA BBA AECB ASBP CL CLR etc.
      - To fill the knowledge gap



GBE

https://GreenBuildingEncyclopaedia.uk

CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

Investing in Opportunities

This project has received European Regional Development Funding through INTERREG IV B.

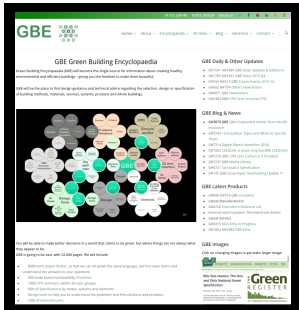
INTERREG IVB

RIBA Plan of Work

- –O C
-
-
- existing
- 9 = Deconstruct, reclaim, reuse, reassembly
- 0-9 = O Circular Building

RIBA Education Committee

-
  -
  -
  -
-
  -
  -
  -
-
  -



GBE

https://GreenBuildingEncyclopaedia.uk

CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

Investing in Opportunities

This project has received European Regional Development Funding through INTERREG IV B.

INTERREG IVB

Post-Declare Initiatives

- Aecom
- Ambitions to create materials exchange website
- But some already exist
- What will be different?

Product Passports?
Materials Passports?

-
  -
  -
    delivery ticket
-
  - ‘Materials’ or ‘Resources’ in second life
  - With a reclaim materials passport and delivery ticket
  - Avoiding a waste transfer note
-

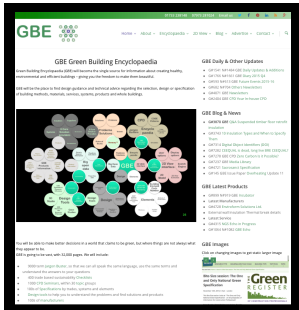
Extended Producer Responsibilities (EPR)

-
  -
  -
  -
  -
    - Or houses built like caravans: Craig White
- manufacturer or a dedicated specialist
- Returned for recycling

Purpose of Materials Passports (MPs)

-
-
-
-
-

  in 2nd use
- Of merchantable quality: may/not be relaxed
  - Frost damaged roof tiles more valuable that pristine
- Provide guidance on their properties and application
- Provide a great deal of information about original materials
  - Probably more than the OEM or OPM ever did
    -
    -



GBE

https://GreenBuildingEncyclopaedia.uk

CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

Investing in Opportunities

This project has received European Regional Development Funding through INTERREG IV B.

INTERREG IVB

Goals & Benefits of MPs

-
  - Circular materials, components and building products (CM,C&BP)
  - which might also be healthy, environmental (HE)
-
-
-

  CoP)

  partnerships (CoPP)
- Support materials choices in reversible building design projects
- Reduce eco-footprints
- Make it easier for developers, facility manager, and renovators to choose HE CM,C&BP
- Facilitate reversed logistics of reclaim CM,C&BP
- Assessment of future materials flows
- Management of supply and demand
- Assessment and forecast of potential secondary raw materials
- Systematic recovery and utilisation strategies can be identified and further developed
- Strategic positioning of plants (e.g. recycling, materials traders, material exchanges, etc.)
- Strategic supply chain management
- Link and make relevant data available for assessment on various hierarchy levels
- Reduce the cost by managing resources rather than managing waste
- Develop a sustainable life cycle management of CM,C&BP and buildings
- Eliminate waste and reduce the use of virgin resources
- Improve the quality, value and security of materials supply
- Provide a tool to move from linear system to a circular system
  - (BAMB, MH & WL, '19)(GBE BRM '19)

Other benefits of MP on Circular Economy

- Helps convert from Linear Economy
  - Via a Segregating for Recycling Economy
  - To a Reclaiming for Circular Economy
- Where we value stuff (e.g. natural materials)
- Where we waste nothing
  - Were nothing ends up in landfill
- Everything is upgraded, repaired, refurbished, to extend its first life and subsequent lives
- Everything is remanufactured and returned to use or repurposed for other uses

Material Passport contains:

- Physical Properties
- Chemical Properties
- Biological properties
- Material Health
- Unique Products & System Permutation Identification
- Design and production
- Transportation and Logistics
- Construction: Identify materials and Product locations in buildings and in elements
- Use and Operate Phase maintenance information
- Disassembly and Reversibility
- Reuse and Recycling

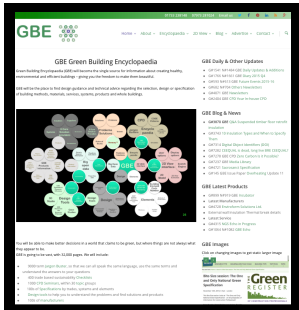
GBE Product Data Collection

-
-
  manufacturer and product
- 35 Document outputs
- E.g. Specification, Method statement, etc.
- Including: Reclaim Product Material Passport

BIM PDT Templates v Flexibility

- Templates developed by BSRIA, CPA and Sector Stakeholders
- Stakeholders include Manufacturer Associations
  -
- LCD Lowest Common Denominator
  -
  -
- BIM PDT Product Data Templates
  -
  -
  -
- Manufacturers want to promote
  -
  -
  -
  -

    substitution



GBE

https://GreenBuildingEncyclopaedia.uk

CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

Investing in Opportunities

This project has received European Regional Development Funding through INTERREG IV B.

INTERREG IVB

Provenance

- Comes from antiques world
  - Where from, who made it, when, whom owned it,
  - Applies to Architectural Salvage
- Audit trails back to source
  - Theft Alerts Helps avoid Theft or retrieve stolen goods
- Materials Stewardship for reclaim
  - Forest Stewardship Council (FSC) for sustainable new timber
  - Chain of Custody (CoC) for sustainable new timber
  - EU timber regulation (EUTR), for legal new timber
- Chain of custody (Chain of Possession in BAMB)
  - Linear: from source to supplier/processor/site
  - Circular: from first life to next use
- Can mean a clean bill of health or warn of limitations
  - Avoiding Carbonated concrete or Alkali Aggregate Reaction "Concrete cancer" joining Recycled Concrete Aggregate
  - Avoid Spoiling recipe

Blockchain technology

- (minus the BitCoins)
- Any individual or multiple transaction up/down the demand/supply chain
- Robust data that is not possible to alter
- Visible to all parties at any time
- All data in place permanently
- Can be added to as supply chain extends
- Audit trails without long searches first

Digital Object Identifiers (DOI)

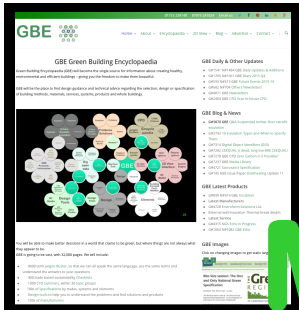
- Ex Pharmaceuticals Sector
- Big Data, Open Data,
- Better Information Management (BIM)
- Product Data Templates (PDTs)
  - Product Data Sheets (PDS)
  - Individual cells cannot hold many data sets so each cell can become search engines to other sources
  - Or DOI link to correct information sources
- Act a bit like SEO 301 Redirects
- DOI Tracking and linking to on-line data:
  - That might move in a website to a new URL
  - But should remain current
- Audit trails to numerous end addresses
  - as stuff subdivides into variations of the original
  - as stuff divides and disperses to different end uses

Industry Sector Response to Material Passports

- Manufacturer Association (UK) Federations (EU)
- Looking after Business as Usual
  - Rejected Reclaim Product Materials Passports
  - In case they erode profits *fr*om sales of new goods
    - carpet sector
- Just like the oil and plastic sector threatening
  - The plastics recyclers
  - Ocean plastics collectors

Design Profession Response to Material Passports

- Silence?
- Didn't event know it was being discussed?
- Architectural education wrong focus:
  - Philosophical BS
  - Fantasy Architecture
- College Knowledge
  - Out of date
  - Learning Curve followed by Forgetting Curve
  - Few opportunities to apply knowledge, so forget



GBE

https://GreenBuildingEncyclopaedia.uk

CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

Investing in Opportunities

This project has received European Regional Development Funding through INTERREG IV B.

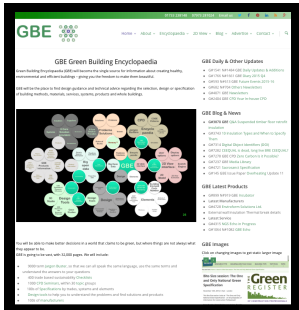
INTERREG IVB

Material Passport: SWOT

- Strengths:
  - More data to allow Appropriate and Competent Reuse
- Weaknesses:
  - Reused aesthetic still a turn off for some
  - Reuse structural competency in doubt
  - Data stored in MPs needs to be kept up to date
  - Dead data in Excel files not maintained:
    -
- Opportunities:
  - Enable others to engage
  - 900 timber visual inspectors in sector
  - Some Structural Engineers will visual inspect steels
  - Steel looses shape in fire before loosing strength
- Threats:
  - Manufacturers do not want to reduce sales of new

Material Passports: Features & Benefits

Features	Benefits
Product/Material Properties	Reapplication Confidence
Application properties	Reapplication Competence
Manufacturer's Reputation enhanced	Satisfied Customers



GBE

https://GreenBuildingEncyclopaedia.uk

CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

Investing in Opportunities

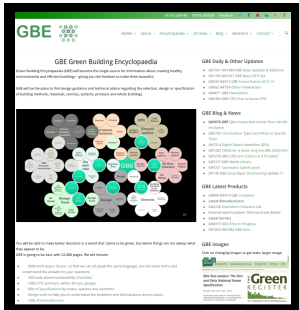
This project has received European Regional Development Funding through INTERREG IV B.

INTERREG IVB

Circular O Building

Appropriate Design Response to MP and Circular Economy

- Rationalisation
- Simplification
- Robustness
- Modularisation



GBE

https://GreenBuildingEncyclopaedia.uk

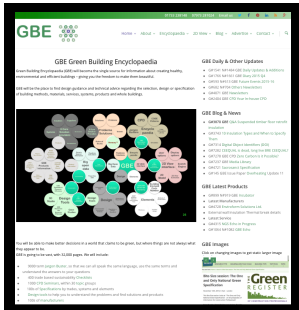
CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

Investing in Opportunities
This project has received European Regional Development Funding through INTERREG IV B.
INTERREG IVB

Rationalisation

- Layering
  - Material, Component, Product, System, Building
  - Site, Structure, Skin, Services, Space plan, Stuff
- Rationalising component life expectancy
  - for consistency in whole building
  - to layers of the building
- CLM Component Life Manuals
  - HAPM, SPON, (no longer)
  - BSI KM, BBA C, ETA, longer life
  - BBA Certificates states Life expectancy



GBE

https://GreenBuildingEncyclopaedia.uk

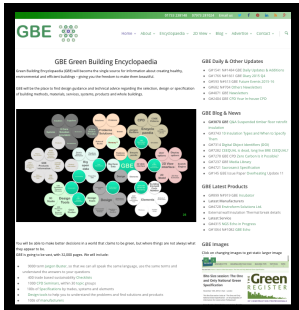
CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

Investing in Opportunities
This project has received European Regional Development Funding through INTERREG IV B.
INTERREG IVB

Simplification: 1 of 3

- Of details and fixings
  - to permit ease of assembly and disassembly
- Fix ability and un-fix ability
  -
  -
  -
  -
- Removable
  -
  -
  -
- No permanent or no undoable joining
  - No glues, adhesives, welding, rivets
  - Weak mortar (lime based) hold apart/together
  - low tack adhesive patch (carpet tiles)
  - Papier Mache (recycled paper and water)



GBE

https://GreenBuildingEncyclopaedia.uk

CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

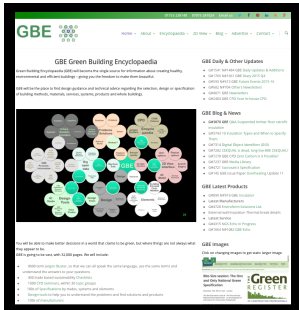
Investing in Opportunities

This project has received European Regional Development Funding through INTERREG IV B.

INTERREG IVB

Simplification: 2 of 3

- Exploit:
  - Gravity
    -
  - Ballast
    -
  - Friction/Tight fit
    -
    -
    - grippy parts
  - Mechanical key
  - Interlocking
    - Timber post and beam with dowels
    - Lego
    - Steko loadbearing timber blockwork
  - Compression and expansion
    - Insulation into rafter space



https://GreenBuildingEncyclopaedia.uk

Cycle Assessment Procedure for Eco-impacts of Materials

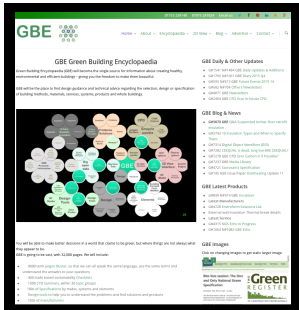
Investing in Opportunities

This project has received European Regional Development Funding through INTERREG IV B.

INTERREG IVB

Simplification: 3 of 3

- Mortice and tenon
- Yurt Rafter connection to apex ring



GBE

https://GreenBuildingEncyclopaedia.uk

CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

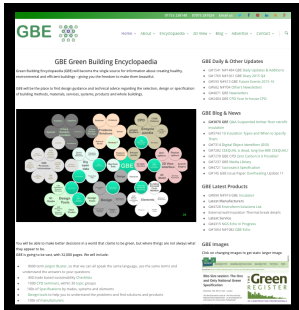
Investing in Opportunities

This project has received European Regional Development Funding through INTERREG IV B.

INTERREG IVB

Robustness

-
-
- space
- Barrel vault canopy
- Transparent Plastic pyramids
- Connected at base
- Connected by timber compression member and aluminium connectors at apexes
- Robust blokes manhandling pieces meant stress fractures in plastics at fixing points



GBE

https://GreenBuildingEncyclopaedia.uk

CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

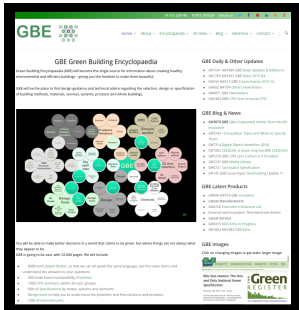
Investing in Opportunities
This project has received European Regional Development Funding through INTERREG IV B.
INTERREG IVB

Modularisation:

- Understanding the size of stuff
  - Working with it, not against it
- Modular with minimal offcuts
  - In first life and subsequent lives
- No offcut waste in first life
  - No redundant non-modular pieces in subsequent life
  - No more offcut waste in subsequent lives
- Exponent:
  - Walter Segal, Self build Architect: Framed & infill, practice no waste
  - Water Segal Method
    - Walter Segal Approach
  - WSSBT Walter Segal Self Build Trust
    - Geoff Stow of BIY Build it Yourself
    - Architype
    - Robin Hiller Forever green projects Ltd.
  - LEGO
    - Load-bearing walls or framed and infill

HERACEY™ expanded for MPs

- to address any of all of the following:
  -
  -
  -
  -
  -
  -
  -



GBE

https://GreenBuildingEncyclopaedia.uk

CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

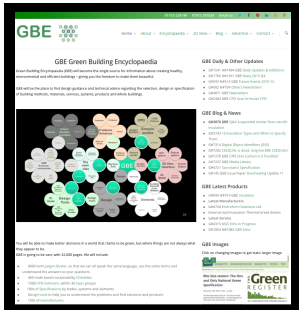
Investing in Opportunities

This project has received European Regional Development Funding through INTERREG IV B.

INTERREG IVB

Healthy:

- Natural Materials and ingredients
- Begs question: why not screening in place of LCA (more later)
- Low to No Chemistry
- Low to No Off-gassing
- Healthy for all along whole supply chain



GBE

https://GreenBuildingEncyclopaedia.uk

CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

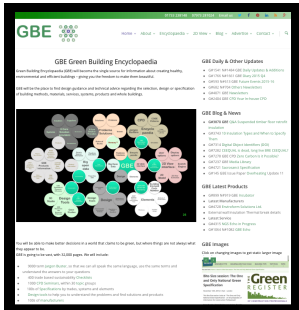
Investing in Opportunities

This project has received European Regional Development Funding through INTERREG IV B.

INTERREG IVB

Environmental:

- Screening of Chemicals
  - CHIP, COSHH, CDM, RoHS, REACH, SVHC, VOC
- LCA Life Cycle Assessment
  - Low to No Petrochemical
  - Low to No Embodied Carbon
    - More Sequestered carbon
  - Low to No Embodied Energy
  - Low to No Embodied Water
  - Low to No Process emissions
  - Low to No Land, Water and Atmosphere pollution
  - Less erosion by excavation or from extraction



GBE

https://GreenBuildingEncyclopaedia.uk

CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

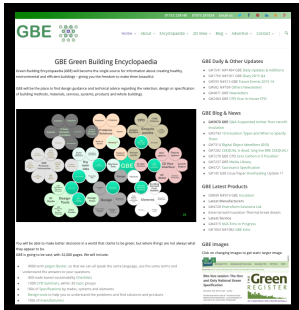
Investing in Opportunities

This project has received European Regional Development Funding through INTERREG IV B.

INTERREG IVB

Resourceful:

-
  - Awareness and approach
  - Changing bad habits, taught or acquired
  - Less centering and cutting perimeters
  - Less Geometry for its own sake
  - Less clashing geometries for fun
-
  - Structures and Services Clashes
  - Services and Building Clashes
  - Building and Structure Clashes
-
  - More Design to suit
  - Less off-cutting waste
  - Bigger components generates more waste
  - Smallest components can make no waste
-
-



GBE

https://GreenBuildingEncyclopaedia.uk

CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

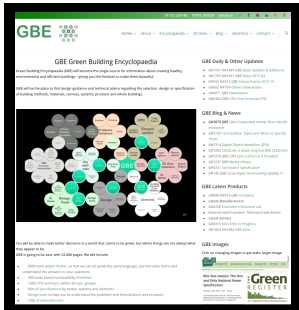
Investing in Opportunities

This project has received European Regional Development Funding through INTERREG IV B.

INTERREG IVB

Not Resourceful

-
  - material module)
  - Wasted material: Off cuts
  - Redundant Parts: Redundant preparation work
  - Higher cost: if waste taken into account



GBE

https://GreenBuildingEncyclopaedia.uk

CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

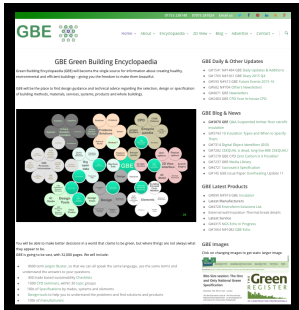
Investing in Opportunities

This project has received European Regional Development Funding through INTERREG IV B.

INTERREG IVB

Appropriate:

- Material properties for:
  -
  -
  -
- Desire to own and care about stuff
  -
- Component + Accessories = Assembly or System
- Performance
  -



GBE

https://GreenBuildingEncyclopaedia.uk

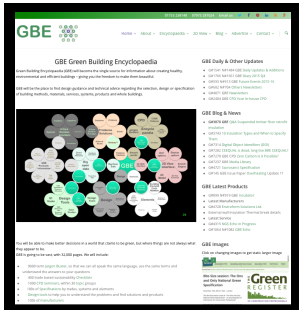
CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

Investing in Opportunities
This project has received European Regional Development Funding through INTERREG IV B.
INTERREG IVB

Not Appropriate:

- Action Programme
- Increase recycled content %
- Catalogued Substitutions
- Ignored important properties
- Unintended consequences



GBE

https://GreenBuildingEncyclopaedia.uk

CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

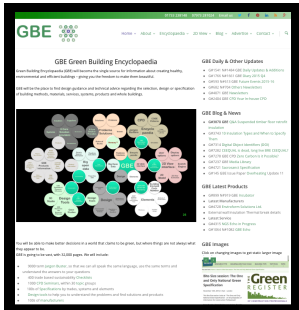
Investing in Opportunities

This project has received European Regional Development Funding through INTERREG IV B.

INTERREG IVB

Competent:

- As manufacturer intended
- Correct application
  -
  -
  -
  -
- Tried, tested and certified
  -
  -



GBE

https://GreenBuildingEncyclopaedia.uk

CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

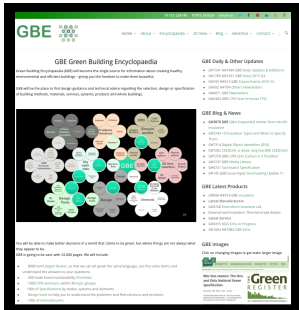
Investing in Opportunities

This project has received European Regional Development Funding through INTERREG IV B.

INTERREG IVB

Effective:

- Much more than efficient
  - Usually diminishing returns on big improvements
- Step changes in performance
- Modular sizing
  - Modular fixing
  - No off cut waste
- Improve the performance of another adjacent component
  - E.g. Membranes or boards around insulation
- Value Engineering stuff into projects not out
  - Holistic view, multi-functional material replaces many
  - Not cost-cutting individual components
  - Not substitution (unless REACH SubsPort)
  - Not joining the race to the bottom
  - Not Kamikaze tendering
- Removal of fasteners from timber
  -
  -
- Removal of preservatives
  - Vac-Vac in reverse to remove most of preservative from softwood
- Application orientation on record
  - Reapply materials in same orientation to avoid risk of frost damage



GBE

https://GreenBuildingEncyclopaedia.uk

CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

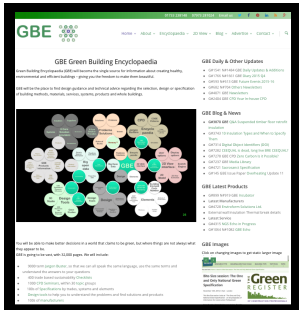
Investing in Opportunities

This project has received European Regional Development Funding through INTERREG IV B.

INTERREG IVB

Ethical

- **Development Goals (SDG) for all**
  -
  -
  - supply chain



GBE

https://GreenBuildingEncyclopaedia.uk

CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

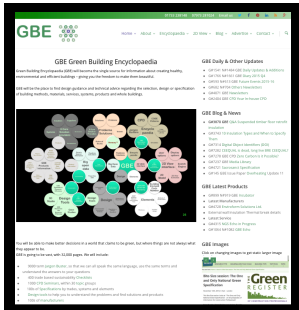
Investing in Opportunities
This project has received European Regional Development Funding through INTERREG IV B.
INTERREG IVB

Yardstick

- Benchmarking
  - Setting agenda: brief targets
  - Setting new standards for way forward
  - Setting new trading Models
- Not pay-back periods
  - But carbon-back periods

Complimentary activities

- Salvo
- SWMP
- Material Exchange
- Others



GBE

https://GreenBuildingEncyclopaedia.uk

CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

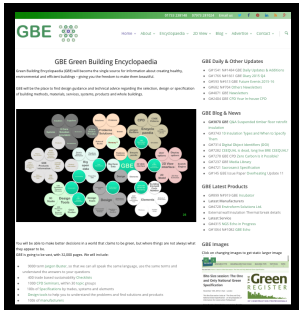
Investing in Opportunities
This project has received European Regional Development Funding through INTERREG IV B.
INTERREG IVB

Salvo

- Architectural Salvage
- Reuse not recycling
- Sector Gateway
- Buying and Selling
- Salvage Protocol
- Pre-Alteration Pre-demolition Audits
- Theft Alerts

Site Waste Management Plan

- Checklists
- Workshops
- Tools
  - Envirowise (Packaging calculator)
  - BRE (SmartWaste tools)
  - WRAP(Waste and ResEff tools)
- Calculators
  - GBE Waste Cost® Lite
  - Envirowise Packaging Calculator



GBE

https://GreenBuildingEncyclopaedia.uk

CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

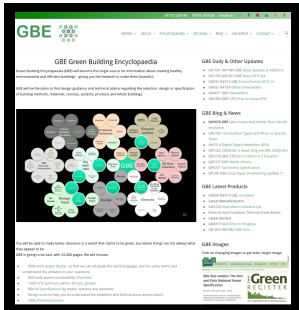
Investing in Opportunities

This project has received European Regional Development Funding through INTERREG IV B.

INTERREG IVB

Material Exchanges

- Virtual and real
  - –
  - –Aggregain (gone)
  - –CIRIA (recycled)
  - –BREMAP (gone)
  - –Salvo (Architectural Salvage)
  - –BioRegional Reclaim
  - –%%%



GBE

https://GreenBuildingEncyclopaedia.uk

CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

Investing in Opportunities

This project has received European Regional Development Funding through INTERREG IV B.

INTERREG IVB

O Others

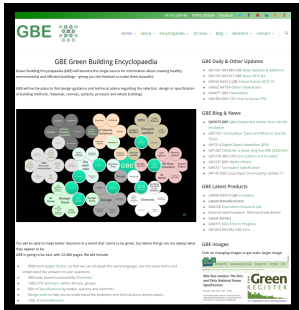
- (invented in Scotland) In 2 parts
-
  - Segregation colour codes
-
  - Wordy design Guides
  - Architects can't read
  - RIBA Library Policy: Picture books not reading books
-
  - Publications and tools
  - No longer interested in Construction
  - Legacy persists but not so visible
-
  - Haves and Wants
  - Joined up Businesses
-
- HAZRed Hazardous Waste Reduction (information)
  - (Now Scottish Website)

How + where used in O Building

- Structural Frame
  - Bolted/clamped connections
- Loadbearing Walling
  - brick/block and lime mortar
- Panel construction
  - Framed and Insulated
  - Solid
- External Claddings
  - Wall, roof, soffits
- Internal linings
  - Floor, wall, ceiling

Products + Accessories = Systems

- Elements or Sub-elements
  - or
    - Plus Accessories
    - Equals Systems
      - System Permutations
  - the parts
- Essential
  - XRef between parts to obtain whole



GBE

https://GreenBuildingEncyclopaedia.uk

CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

Investing in Opportunities

This project has received European Regional Development Funding through INTERREG IV B.

INTERREG IVB

Accessories include:

- Fixings
- Spacers/leveling shims
- Fastenings
- Isolation (electrolytic/bimetallic)
- Tapes (Air tightness, etc.)
- Sealants (avoid gunned, use strips)
- Adhesives (avoid where possible)
- Ballast
- Etc.

Products + Finishes

- Potentially complicates reuse
- Scratched finished need repair
- Sacrificial coatings help use or reuse
- Corrosion protection helps disassembly by bolts or other fasteners
  - (not shearing heads off screws)
- Corrosion protection helps prevent discolouration of fastener or material

Ingredients + Recipe = Materials

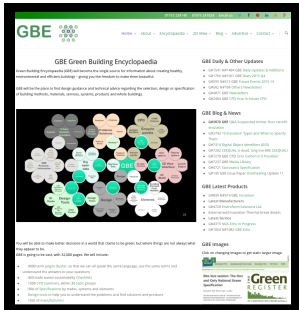
- Resources
  - Materials
- Mixes
  - Recipes
  - Conglomerates
- Materials
  - Components
    - Elements

Materials + Bonding = Composites

- Materials
  - Ingredients
- Layers
  - Matrix
- Binder
  - Bonding
- Composites
- Systems
- Build-ups

Bonding materials in layers = Build ups

- Leveling
- Smoothing
- Decorating
- Protection



GBE

https://GreenBuildingEncyclopaedia.uk

CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

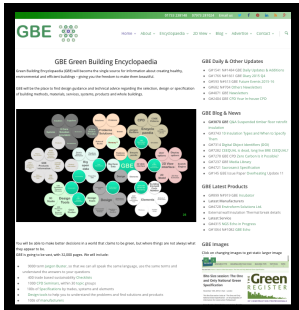
Investing in Opportunities

This project has received European Regional Development Funding through INTERREG IV B.

INTERREG IVB

How used in building

- Bolted or clamped steel frames
- Lime Mortar jointed (not cement)
- Layered components in elements
  - Overlap tiling
  - Overlap boarding
- Framed and open jointed Rain-screen cladding
- Visible fixings not hidden (weatherboarding)
- Avoiding interlocking e.g. T&G joints
- Interlocking Mortise and tenon Joints, removable dowels
- Buried or surface mounted metal connectors
  - Special angles for fasteners into end grain
- Nailed or cleated/screwed light timber frame panels
- Riveted or crimped light steel frame
- Zed Factory spacing brackets for consistent spacing for modular



GBE

https://GreenBuildingEncyclopaedia.uk

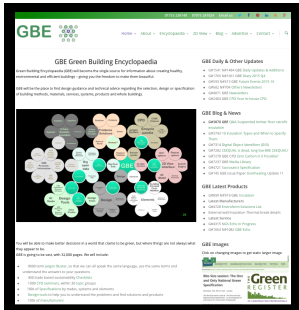
CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

Investing in Opportunities
This project has received European Regional Development Funding through INTERREG IV B.
INTERREG IVB

Revision table

Revision	Date	Comment	Initials
A00	24/10/19	Created and presented to ZWS +SEDA Circular Economy event	BRM
A01	26/10/19	Added to GBE website	BRM
A02	29/10/19	Updated in Word, PPTX and website	BRM



GBE

https://GreenBuildingEncyclopaedia.uk

CAP'EM

Cycle Assessment Procedure for Eco-impacts of Materials

Investing in Opportunities

This project has received European Regional Development Funding through INTERREG IV B.

INTERREG IVB

© GBE 2019

-
  - Technician and Architect by Training
  - Specification Writer by Choice
  - Environmentalist by Actions
-
-
-
- https://greenbuildingencyclopaedia.uk 2015
- E BrianSpecMan@icloud.com
- Twitter: http://twitter.com/brianspecman
- LinkedIn: BrianSpecMan
- Facebook: BrianSpecMan
- http://www.facebook.com/brianspecman
- Pinterest: Brian Murphy • GBE Green Building Encyclopaedia