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GBE CPD Product Evaluation

LCA EPD, how to use them & Alternatives

GBE CPD for HTA 09/10/20

This Presentation on GBE:

- Find this file on GBE website at:
- https://GreenBuildingEcyclopaedia.uk/?P=38719
- Go there for:
  - the latest update
  - versions presented to different audiences
  - the whole presentation, all of the hidden slides
  - other file formats:
    - Handout, Show, PDF, (PPTX in the shop)
  - Links to other related GBE CPD and related GBE content

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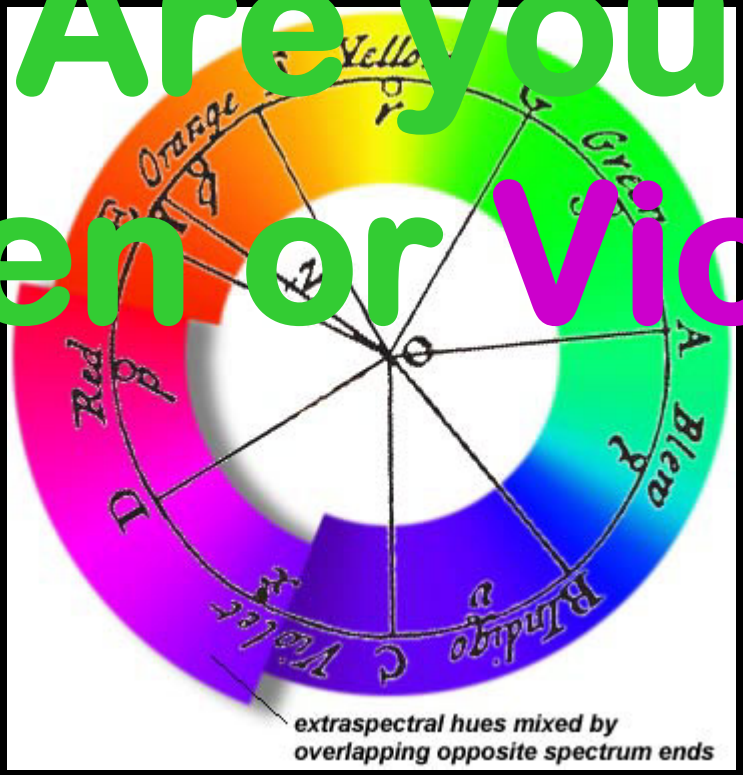
Are you Green or Violet?



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Definitions: Green

- Otherwise: Environmental
- For most in Business: Sustainable
  - So they can compromise for profits
- For many they revert to energy efficiency
  - Others think its renewable energy and eco-bling
- many have their own definition
- many are unsure of its meaning
  - Environmental
  - Economic
  - Socially responsible
  - Natural Resources
  - Responsible Sourcing
  - Political: Green Party

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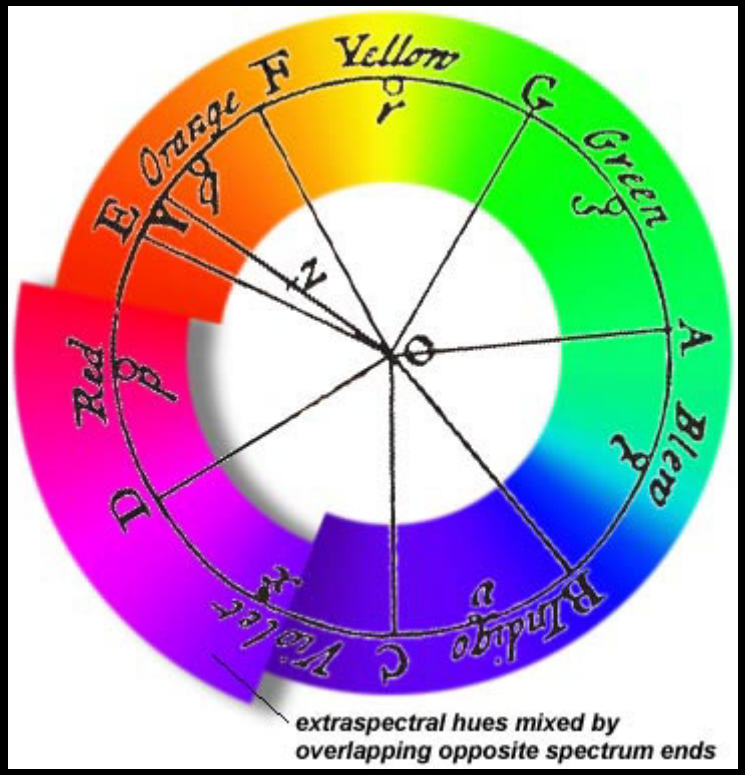
Sustainable
Eco
Green



Violet
Violent
Violate

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'Violet'

- 'Violet' chosen as it is at the opposite end of the spectrum from 'Green'
- Not far from violent and violate
- Others prefer Green-Brown, Green-Red, Green-Black,
- Not Purple

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'Violet' Materials

- 'Violet' meaning:
- 'any material, construction product, construction method or building
- unfriendly to humans or the environment or
- whose performance diminishes in use or over time'

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'Violet' Industry

- Clients/employers, developers, designers, Quantity Surveyors, contractors, manufacturers, applicators/installers
- anyone that does not care about the environment
- or anyone that does not act on its behalf
- Virtually the whole industry
- But its changing
- Too slowly

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Are you Green or Violet?

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I am a shrinking Violet

a little green
round the edges but
less violet everyday

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Definitions

- Green
- Greenies: the people that do Green
- Light or Dark Green or Greenies
- Greenie Points: Brownie Points + Green (all positive)
- Violet: Opposite of Green
- Violets: the people that don't do Green
- Light or Dark Violet or Violets
- Whitewash: cover-ups telling porkies
- Greenwash: telling green porkies

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Green:

- But Corporate Greenwash prevails
- Large PV arrays are saying we spend a lot on gestures not a lot on actions
- Check what else they are doing

Violet Materials

- Non-renewable, finite
  - Fossil derivatives, fuel,
  - Petrochemical, chemicals, synthetics:
    - Paints
    - Plastics
- Unsustainable
  - Carbon based: e.g. Fuel
  - Release Carbon in manufacture or use: e.g. Cement
- High embodied energy: e.g.
  - Metals: Aluminium
  - Plastics
  - Cement
- Hazardous materials and hazardous waste:
  - Wet, sticky , gooey or flows:
    - resins, paints, sealants, chemicals,
  - Fine particulate: e.g. cement, asbestos, ceramic fibre
  - Corrosive, acidic, alkali,
- Ozone depleting & Global Warming
  - Foamed plastics HFCs HFAs

Green: Environmentally Sustainable Materials

- Renewable: timber,
- Rapidly renewable: Plant based materials
- Abundant: Site subsoil, rocks, sand, gravel,
- Recycled & Recyclable:
  - post consumer content,
- Reclaimed & Reused: on site materials, timber not chipboard
- Carbon already out there:
  - reclaimed bricks, slates, stone
- Carbon sequestration: Carbon negative:
  - Plant and timber based
- Low embodied energy: Plant based
- Local: low transport miles: low transport emissions

Social Sustainable Materials

- Socially responsible: Fairtrade equivalents
- Pay the right price v plunder the world
- Local: materials, crafts, companies, tradesmen
- v
- Cheap labour abroad where nobody sees or cares

Healthy Materials

- Low VOC?: but not loads of other chemicals to achieve it
- No hazardous materials in application and use
- No hazardous waste
- Low allergy
- Low to Zero toxicity
- Indoor air quality (ignored by BRE GG)

Economic Sustainable Materials

- Long term economic to maintain
- Long term economic to run
- Reclaimable, reusable and resalable
- v
- Short term cheap to build
- Expensive to run
- Sometimes risky in use

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General claims made in Greenwash

- Sustainable
- Environment Friendly
- Eco-friendly
- Recycleable
- Recycled
- Managed Forest
- CFC free
- HCFC free
- ZODP
- Water based
- Solvent free
- Low VOC
- Energy saving

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How materials were chosen

Alternative to LCA & EPD

GBE CPD for HTA 09/10/20

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How materials were chosen

- Historically: Local (site) materials, hand made, self build, self maintain, local labour,
- Traditional:
  - Tried and tested, failed and forgotten, succeeds and adopted, long life, durable,
  - Earth, Clay, Brick, Stone, slate, Lime,
  - Timber and straw
    - sometimes combustible until Fire of London,
- Pre 1919: solid, brick or stone, lime mortar and plaster, moisture permeable, flexible, air leaky to feed open fires
- Post 1919:
  - Ventilated cavity construction, Moisture resistant, Brick or slate DPC,
  - Increasing cement content, stronger rigid construction, cavity uninsulated

How materials were chosen

- Date?: Merchantable Quality, Fit for Purpose
- 1956: Or Similar case law (weak words risk building competency)
- 1957: Treaty of Rome (not much influence until 1992 onwards)
- 1960s : Asbestos health risk
- 1970s: Oil Crisis added insulation to buildings (1980s in London)
- Price & thinness driven: mass production efficiency, chemistry intense, environmentally naïve, combustible
- 1980's Ozone Holes identified, ODP no longer permitted
  - (but no outright ban)
- Following the Rules Competently:
  - BRAD, BS & CP, BSI Kitemarked & BRE Guidance and PII,
- Durability: Component Life Manuals,
- Breaking the Rules Competently:
  - BBA Agrément Certified (Price & Innovation driven)

How materials were chosen

- Client Brief, Developer Profits, User Needs
  - v Architect's aspiration
- Design & Build (reality B&D: Build then re-design re-specify)
  - Contractor specifiers, priority: cheap, result: Performance Gap)
- Procurement Methods:
  - Faster faster faster
  - GC > D&B > MC, CM, DMC, BOOT, GMP,
  - Chemistry intense solution to truncate conditioning and curing times
  - Collateral Warranties
  - PFI PPP: BOOT 25 years
    - 25 year guarantees (warranty with premiums to pay)
- Post 1992: BRAD, Reg. 7, CPD/CPR, CEN, EuroCodes, Agrément, ETA European Technical Assessment, CE mark, or equivalent, EU Procurement Rules, 2nd Edition

How materials are chosen

- Recently (consciously, otherwise or not at all)
  - Local Climate >
  - Appropriate Elemental Assembly >
  - Functional Component >
  - Application Position >
  - Vapour open/closed > (Historic fabric is a spectrum)
  - Material Screening >
  - Product Selection >
  - Cost consideration
- Thermal mass,
  - de-materialisation, No Suspended ceilings
  - fair faced concrete soffits, acoustic issues?
  - resin bound, sealed, finished
  - Metal soffits do not work for thermal mass

How materials are chosen?

- Health and Safety:
  - mostly ignored, until REACH which has teeth, but nobody is biting
  - CHIP, CDM, COSHH, RoHS, REACH, SVHC, SIN Lists, Red Lists
  - Green Lists & Guides
- BRE Green
  - BREEAM > Mat 1 > BRE GGtS or EPD, EP, GreenBookLive,
  - > then the 'Recently' above?
- Health and Wellness:
  - Sick-building syndrome, IAQ, Off-gassing, Chemistry content, VOCs,
  - materials choices: Well wash?
    - Biophilia, VOC Test evidence, EPD, Ska Good Practice measures
- Post Grenfell: Non-combustible & Insurers discretion
- Housing Crisis:
  - MMC, OSC, Lightweight, thinness, overheating, Decrement Delay, Thermal mass
- Climate Emergency Behaviour Change campaigns
  - Carbon Dioxide, Embodied Carbon, In use carbon, data from LCA & EPD
  - Sequestered Carbon, Bio-based materials and constructions
  - Earth based construction (Interreg: CobBauge; Tom Woolley Books

Post 2020: Brexit (no more EU rules!) Covid (Anti-bacterial finishes?)

We need step-changes

- We need rapid changes in behaviour
- We need good easy to use guidance
- We need to have confidence in it
  - to be able to trust it
- It needs to facilitate change
  - And not to discourage
- It needs to look at materials first
  - and than look at them in the context of construction
    - Competent construction assemblies
    - that we may be unfamiliar with
    - To give us confidence to go there

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GBE Position

- Technician & Architect by training & Specifier:
  - 45 years experience
- Serving Architects & Specifiers
- Look at environmental issues as if Architects & Specifiers serving clients
- 20 years of dedicated environmental specialism
- Aware of GreenWash, WellWash and ask more detailed questions
- LCA specialist in our team
- CAPEM LCA & EPD Interreg Funded project under our belt

Architect's Basic needs:

- Basic Product Information
  - Intended purpose, Advantages/Disadvantages, properties
- Right or wrong for project to add to shortlist
- Avoidance of Liability
  - Competent construction assemblies
- All the parts
  - In the right order
- Complying with:
  - Building & Environmental Regulations
  - Code of Practice
  - Manufacturer's recommendations and requirements
  - BBA Certificate requirements
  - Industry Best Practice

Architect's basic wants

- Application Specification
  - For contract documents
- CAD files of assemblies or products
- Eco-System/Label with quick overview
- Positive attributes taken into account
- Not just least-negative impacts
- Results compare well with gut instinct
- Confidence in the system/label
- Eco scores for materials/products
  - Enable unique elemental assembly and building scores
- Do your own calculations instantly

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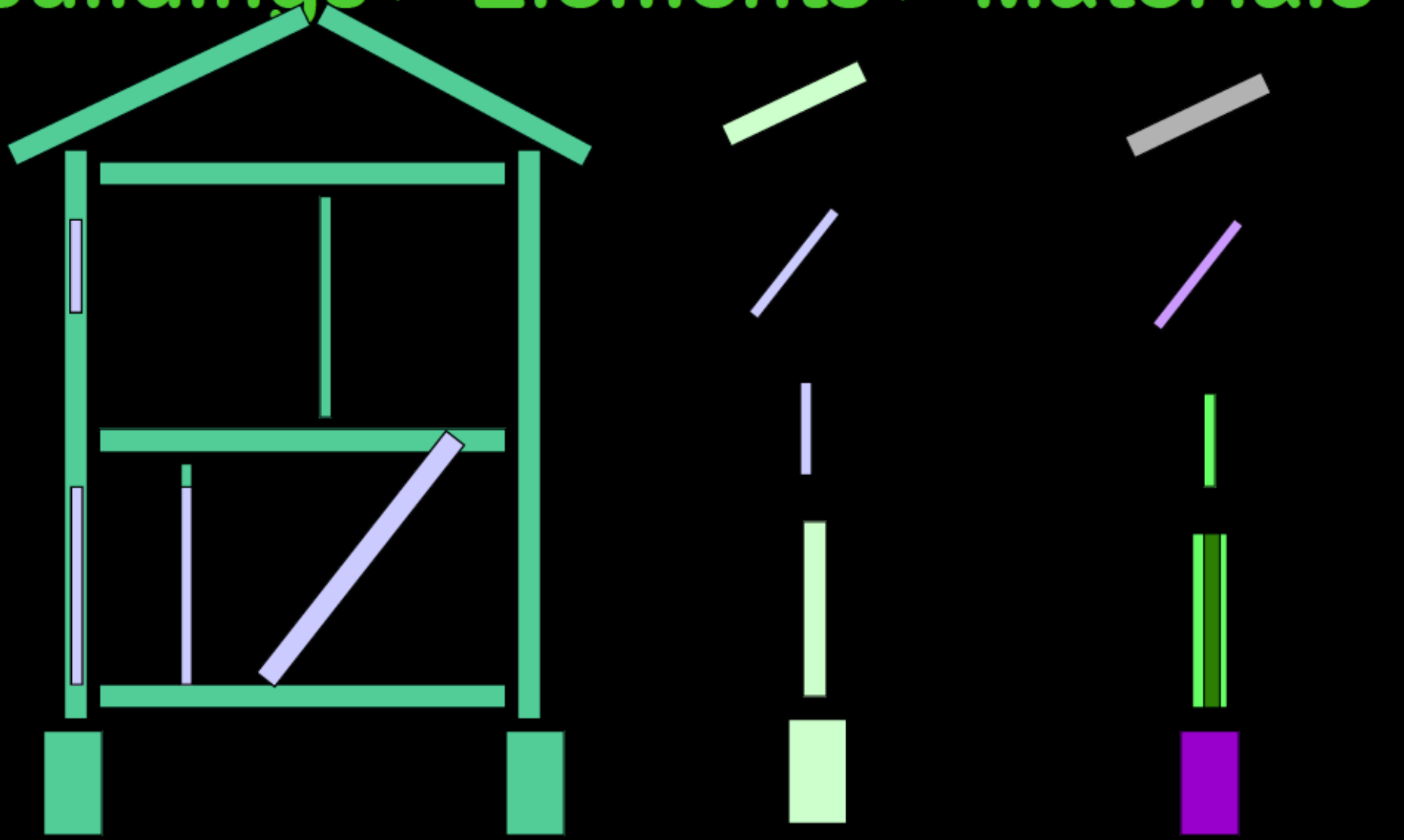
If interested in more:

- Access to the data source
- Comprehensive declaration of content of substances
  - (not like MSDS)
- LCA Life Cycle Assessment
  - (confidential)
- EPD Environmental Product Declaration
  - Public Declaration
  - (until associations prevent it)
- Ability to interpolate between results
  - Unlike BRE Green Guide to Specification

Buildings > Elements > Materials



Deconstruction & Reconstruction

- GBE consider the contribution of each individual part
- Just like any specifier does
- GBE do not ignore any part of the whole
- GBE look at all issues and tries to find greener products for every part
- If you can make an environmental choice in every part, why wouldn't you?
- GBE then looks at them in elemental assemblies & then in buildings
- GBE aims to promote competent assemblies and avoid compromising materials within their assembly

Traffic Light Systems

- When you put all the issues on a traffic light system it's actually very useful in order to make a decision
  - BDP have done something similar for interior design products 2006
  - Ska (Elina Grigoriou) uses a screening system for office fit-outs which include: does it have an EPD?
  - OneEcoHome (2 ladies) website had one but the site and shop is closed 2008, until better times perhaps.
  - Betternest (Edith Colomba) were developing a sustainability easy screening system for refurbishment, finding ways to make it lightweight to use.

Top Trumps


PLASTIC (HDPE)
HDPE
SUSTAINABLE FEATURE
SCORE
Embodied Energy
84.4
Embodied Carbon
2
Landfill Decomposition
never
Recyclability
80
Toxicity
high
Durability
20

Top Trumps

- A card game where the players choose between characteristics hoping to find one that is higher scoring than their opponent
- The same game that manufacturers play in advertising
  - Promoting only one characteristic over all others (thinness of insulation, ignoring fire, micro-plastics)
- LCA & low price is also used by D&B Contractors to choose products,
  - with little consideration for other characteristics
  - BRE Green Guide C > A rated PVC Windows
  - High recycling in PVC but very little into windows

Level Playing Field?

- LCA provides an opportunity for comparison of all materials on an equal basis
- LCA and EPD are done for any ingredient, material, product
- Creating a level playing field
- But only if all materials are processed and included
- And only if all are compared on an equal basis
- Its unfair to only have one team on the pitch
- If one team is missing the other team look good on their own
- BRE Green Guide to Violet Specification = one team

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GBE Screening

Jump to LCA EDP

Jump to GBC Calculator

Alternative to LCA & EPD

GBE CPD for HTA 09/10/20

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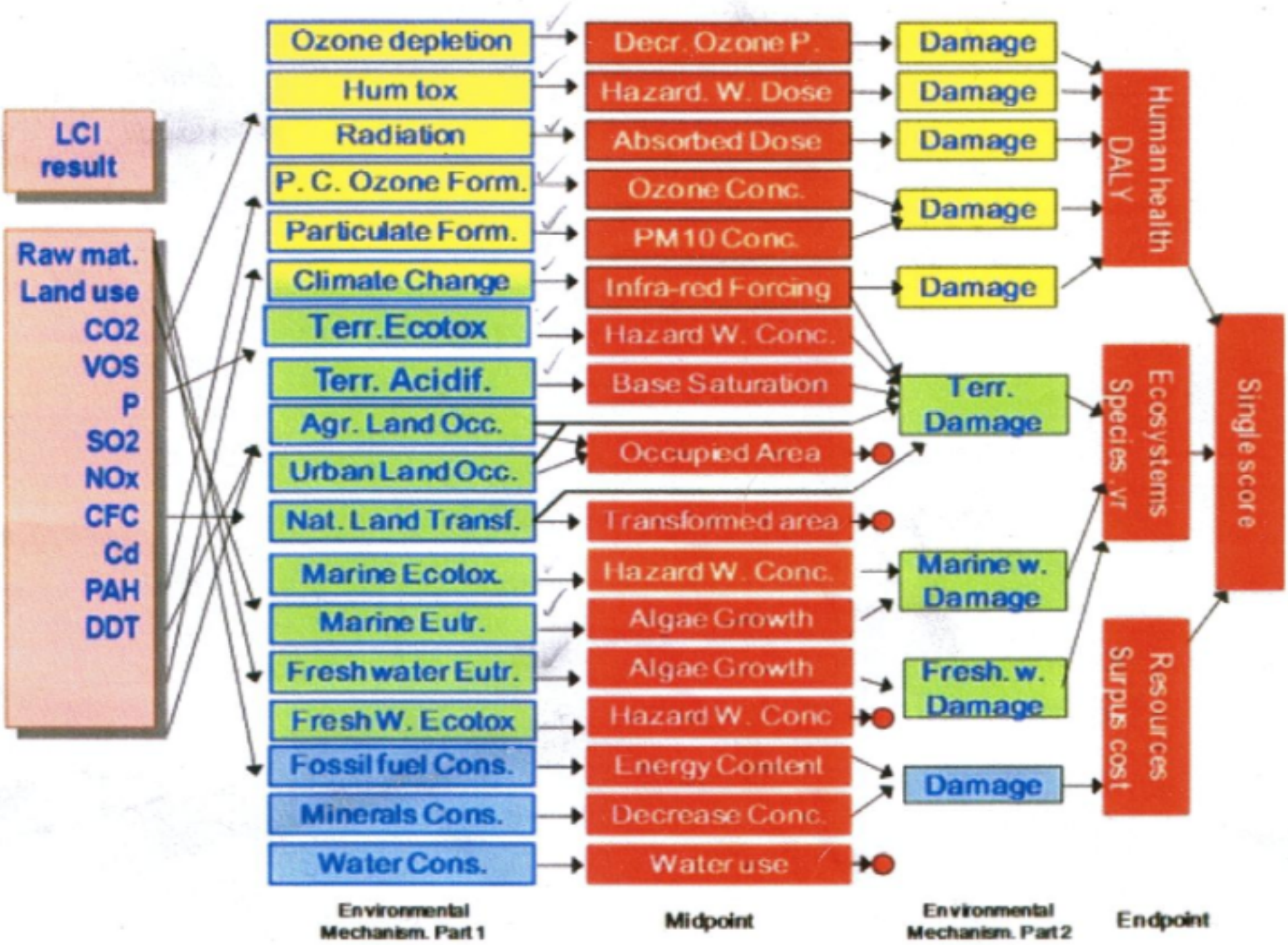
LCA & EPD

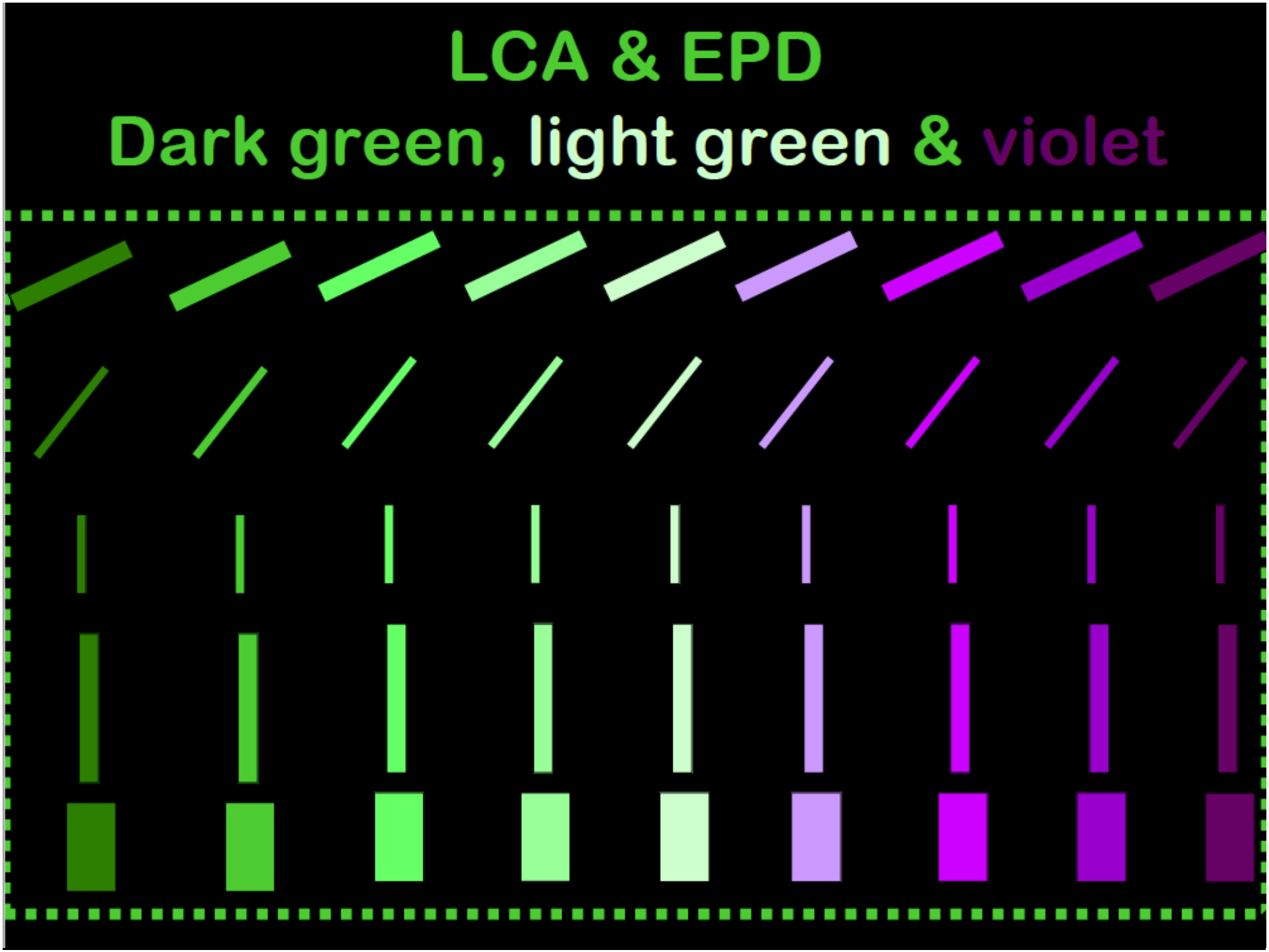
Jump to Screening

Jump to GBC Calculator

Alternative to LCA & EPD

GBE CPD for HTA 09/10/20


LCI result
Raw mat.
Land use
CO2
VOS
P
SO2
NOx
CFC
Cd
PAH
DDT
Ozone depletion
Hum tox
Radiation
P. C. Ozone Form.
Particulate Form.
Climate Change
Terr.Ecotox
Terr. Acidif.
Agr. Land Occ.
Urban Land Occ.
Nat. Land Transf.
Marine Ecotox.
Marine Eutr.
Freshwater Eutr.
Fresh W. Ecotox
Fossil fuel Cons.
Minerals Cons.
Water Cons.
Decr. Ozone P.
Hazard. W. Dose
Absorbed Dose
Ozone Conc.
PM10 Conc.
Infra-red Forcing
Hazard W. Conc.
Base Saturation
Occupied Area
Transformed area
Hazard W. Conc.
Algae Growth
Algae Growth
Hazard W. Conc
Energy Content
Decrease Conc.
Water use
Damage
Damage
Damage
Damage
Damage
Terr. Damage
Marine w. Damage
Fresh. w. Damage
Damage
Human health DALY
Ecosystems Species .yr
Resources Surplus cost
Single score
Environmental Mechanism. Part 1
Midpoint
Environmental Mechanism. Part 2
Endpoint


LCA & EPD
Dark green, light green & violet

LCA Life Cycle Assessment

- Having gone through a screening process you end up with a shortlist
- Then you can compare the results of LCA of your choice(s) to pick the one from a shortlist
- For this reason GBE and 10 organisations in EU (NWE) developed a simplified LCA to support our offering.
- CAP'EM
- Each Project Partner offers LCA

LCA Strength/Weaknesses

- LCAs are good in concept
  - Good solid number crunching
  - but done wrong (with bias or inconsistency) OR
  - buried under weighting systems OR
  - missing the best (Greenest) products
- = no improvements
- = business as usual,
- and a barrier to trade
  - for those not in the club
- More on this later…..

LCA limitations

- LCA studies and scores negative impacts of manufacture, use and disposal of materials and products
- LCA does not look at positives impacts of manufacture use and reuse of materials since there are very few in normal build

LCA & Carbon Sequestration

- LCA does not normally look at carbon sequestration during the growing stage
- LCA of Bio-based products should have the benefit of Carbon Sequestration in the assessments
- PAS 2050 has guidance on its inclusion
- LCA with carbon sequestration will give well rounded results

LCA Green or Violet?

- LCA can find the greenest of the green materials
- LCA can help to find the least violet
- If Green materials are missing
  - LCA finds the least violet of the violets
  - Users might assume they are greenest
  - Especially if the Cover says so
- If the Greens are present?
- LCA will sort the greens from the violet

Beyond LCA

- Impacts also include the Building process itself:
  - construction, maintenance, refurbishment, etc.
- This is beginning to be considered by LCA practitioners
- EN 15804 includes many life stages

EN 15804:2012

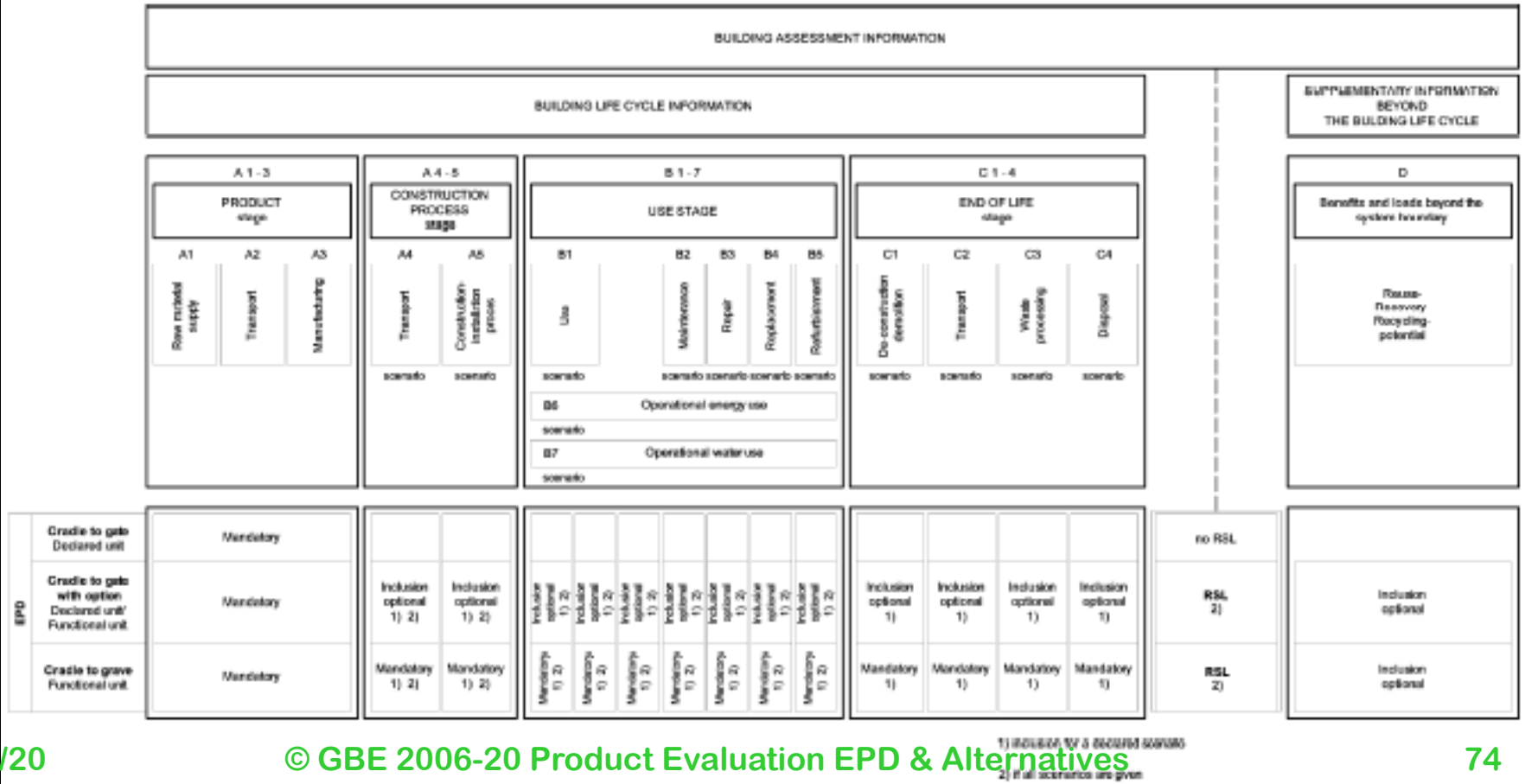


Figure 4 — Types of EPD with respect to life cycle stages covered

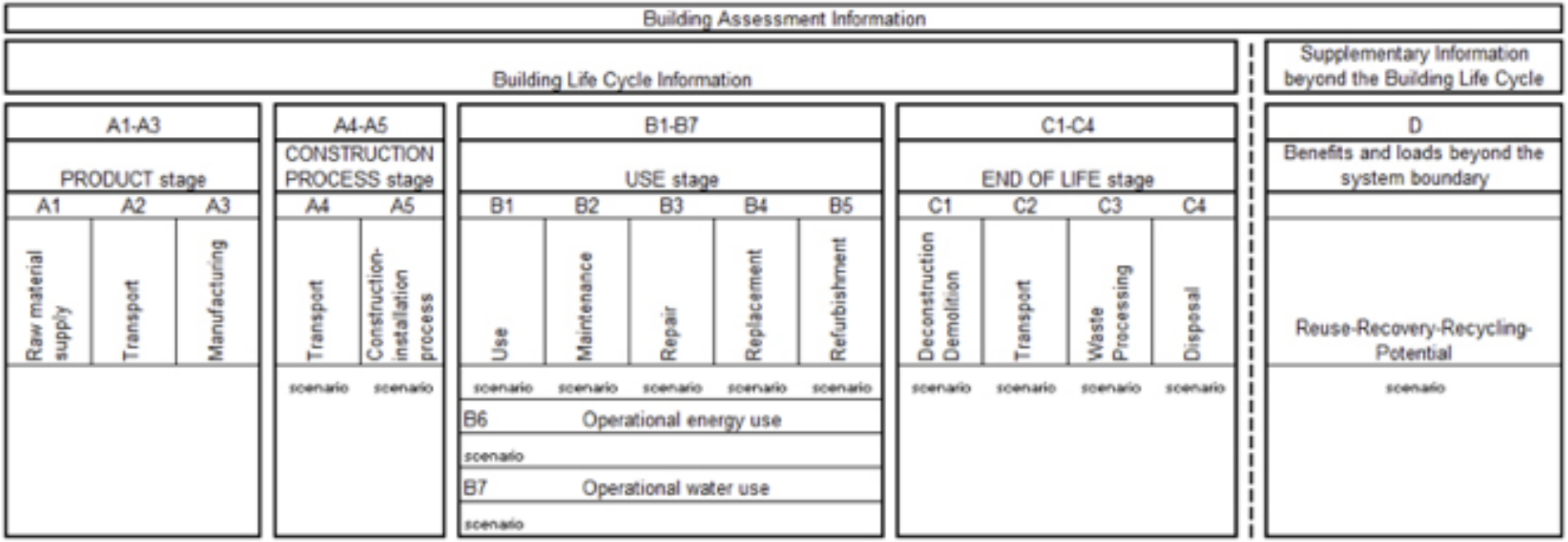


Figure 1: Life cycle stages and modules used in CEN/TC 350 standards such as EN 15804

Less bad is not good enough

- Design is a constructive process
- Designers need info on good materials
- Designers are looking for positive outcomes
- They can and do engage in positive environmental design
- They want credits for positive design
- Not just credits for less bad materials
- LCA alone cannot deliver this

Using LCA alone

- will result in decisions akin to laying a crazy paving play field because it was the cheapest one in a catalogue
- It's obviously the wrong catalogue
- our children want on play on a lawn.

There are positive materials

- But under LCA as they are today
- these positive materials often look bad
  - or less bad than other materials
- E.g. Taking Carbon sequestration into account
- Materials can be:
  - Low Carbon
  - Carbon neutral
  - Carbon negative
- But LCA will not normally show this

EPD Environmental Product Declaration

- An EPD is a statement of facts
  - About the product or material,
  - about its manufacturing processes
  - other issues during the period of the assessment,
- the company pays for the assessment to be carried out by an LCA/EPD specialist.
- All EPD methodology should ideally be consistent and comparable but often are not,
- There are many variables including:
- Product Category Rules, Declared Unit, System Boundaries, etc.

EPD Environmental Product Declaration

- EPD is the outcome of an LCA
- EPD is a declaration of negative environmental impacts in the creation of a product or a material;
- EPD is the summing up of the negative impacts of all the processes from extraction to packaging and is often but not always based on Cradle to Gate.
- Factory Gate: Excluding Transport emissions, construction, use and disposal emissions

Limitations of an EPD

- EPD is not:
  - a badge of honour,
  - a green label,
  - certificate of compliance
  - an endorsement
- Having an EPD should not be a criteria for acceptance,
  - as in Ska
  - only a means for comparison,
  - however the content may not be comparable
  - And violet manufactures associations do not want EPD to be used for comparison

LCA & EPD Stakeholders

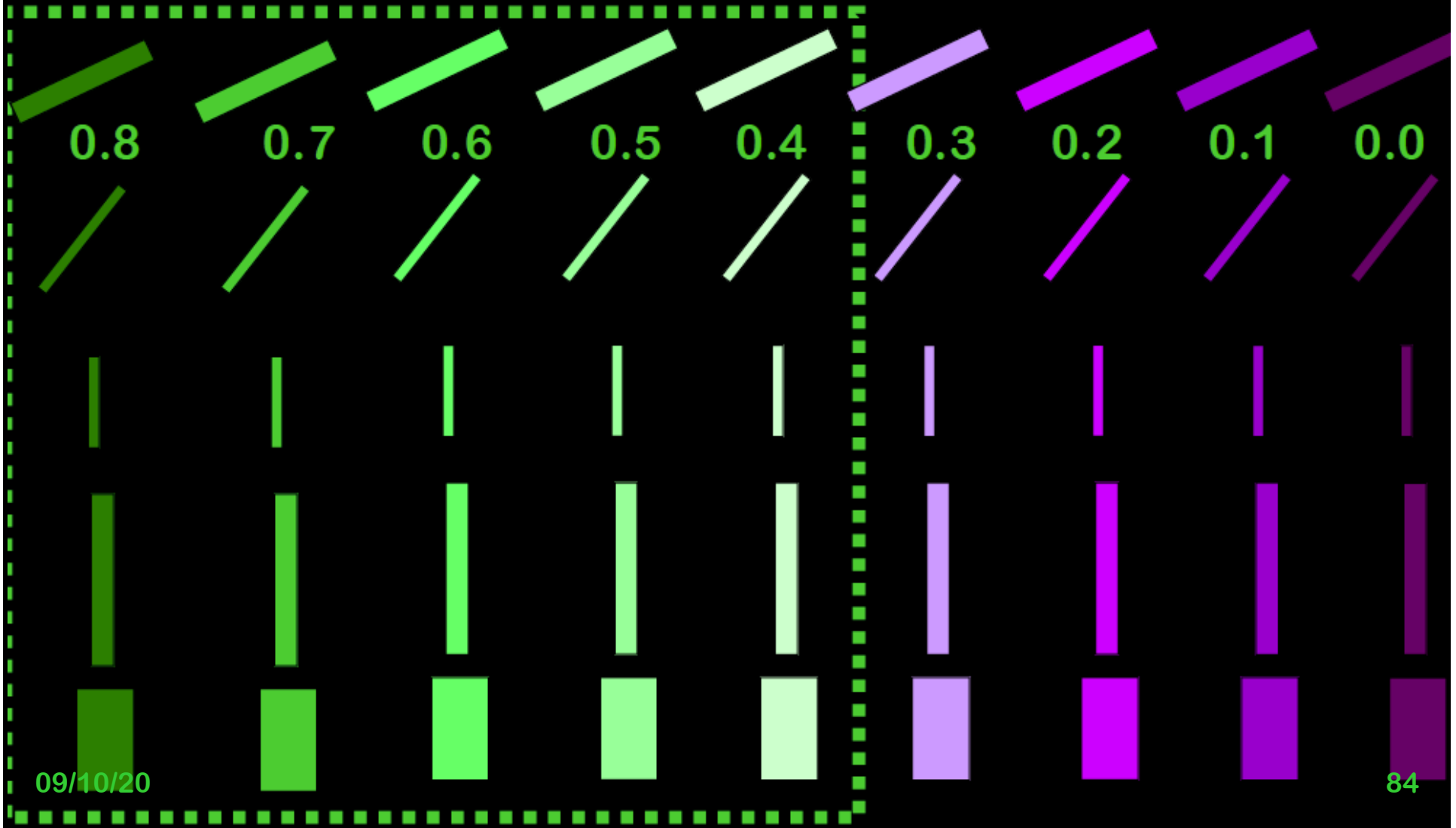
- Include Manufacturer's Associations/Federations
- many are happy to continue with BAU
- They are considered or are powerful in steering committees
- They do not want EPD to be Declared or Published
- They do not want LCA EPD to be used for comparison
- They have ensured any materials is considered at building level
- not at component so useless for specifiers
- nor element level (as BRE's GGtS)

PEF Product Environmental Footprinting v LCA EPD

- EC European Commission started the PEF process
- LCA had been railroaded by stakeholders
- Wanted product by product comparison to be possible
- PEF stakeholders railroaded PEF towards LCA methods
- To avoid 2 parallel systems costing them more
- Making PEF as unhelpful as LCA EPD

Screening: Scoring

Dark green, light green avoid violet



EPD & Marginal Analysis

- An EPC might raise awareness
  - manufacturer may use its results to help them identify problem ingredients
  - find substitution materials to improve the product
- Marginal Analysis shows which ingredient have the greatest share of the impacts
- Might include packaging too
- Replacing that ingredient can significantly the Impacts
- The improved product will need a new EPD.

Moving Targets

- LCAs by different organisation, or with differing Product Category Rules, System Boundaries, Cradle to *, result in incomparable LCA results.
- Compliance with ISO 14025 does not reduce the variability.
- CEN TC 350 aimed to standardise LCA
  - Relate to CE marking & Essential Requirements
- EU Consumer Council challenged TC 350 not to favour manufacturers and to engage with human and societal issues or they would tell consumers to ignore LCA
  - CEN TC 350 was being revised
  - CEN TC 351 is engaging with issues of health
  - CEN TC 350 should embrace CEN TC 351 by now
- All LCA will have to monitor CEN TCs and update at each revision
- Manufactures LCAs need updating at great expense
- Consumers than have to check the date of the LCA and if they include all the latest revisions

EPDs could be brilliant

- they could put all the info you want to compare in one place
- without any weightings, etc.
- but due to their infancy there was a lack of prescribed method of assessment and presentation

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EN 15804

- EN 15804:2012 provided a level playing field
  - And a table of outputs that many are now familiar with
- It has voluntary and mandatory requirements
- Provided a level of consistency and inconsistency
  - Some National Schemes also ask for additional information
  - Inconsistency creeps back in.
- Latest thinking is aligning with PEF
  - Including impacts for any product (outside of Construction)
  - Many impact categories so the table becomes unwieldy
  - Many impact categories that are not regarded as robust enough
    - Some are saying they will add disclaimers in their EPDs
- Others are say concentrate on the GWP, carbon and transport impacts
- Move towards a single summary evaluation
  - Like BRE Green Guide to Specification A to G ratings
  - Dumbing down in my view
  - Convenient for Architects and Brand BREEAM Assessments

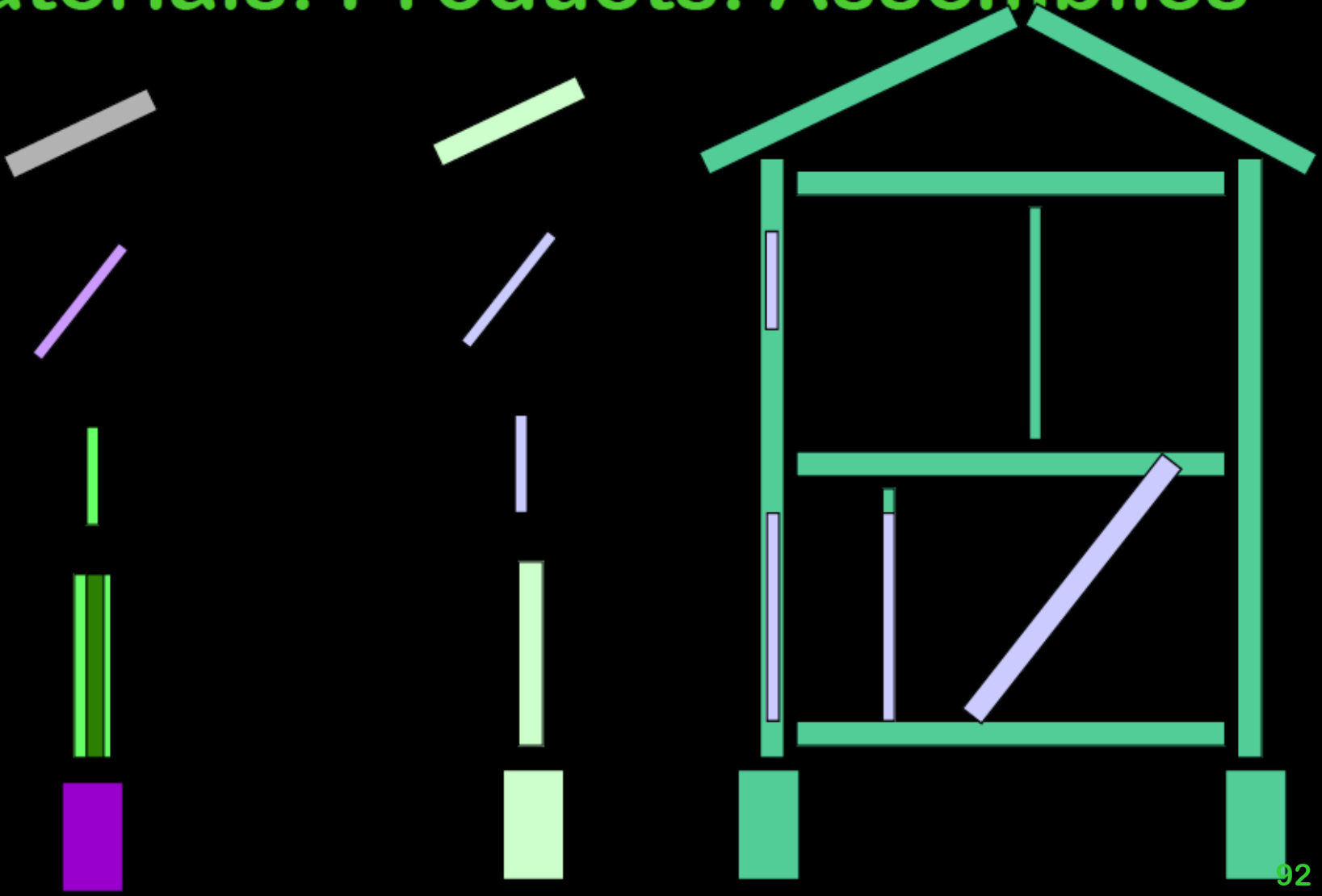
How does Development Control use LCA & EPD?

- In Belgium 2012 future plans
- Developments will be ‘fined’ a fee for development according to the LCA of the Buildings
- If the Building has high impact the fine matches with a high price
- If Greener the fine is smaller
- If substitution happened the fine will rise or fall according to the LCA of the replacements compared to the proposed

How does Development Control use LCA & EPD?

- In UK SPAB STBA Conference 2020
- Discussed a ‘Tax’ for development to reflect the impact of what is built
- However we do knot like ‘taxes’ so come up with a better name?
- Developments will be ‘fined’ a fee for development according to the LCA of the Buildings
- If the Building has high impact the fine matches with a high price
- If Greener the fine is smaller
- If substitution happened the fine will rise or fall according to the LCA of the replacements compared to the proposed

Components: Elements: Buildings
Materials: Products: Assemblies



Elemental Assemblies

- We need to consider how materials are promoted and used in any permutation:
  - Green materials in green assemblies
  - Green materials in violet assemblies
  - Violet materials in green assemblies
  - Violet materials in violet assemblies
- GBC is moving towards screening out the worst combinations to assist with the step changes needed to solve our current problems

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In Use Carbon Reduction

- GBC Green Building Calculator will have:
  - New Build & Refurbishment
  - Robust Detail assemblies
  - Building Regulations Acoustic construction
  - Passivhaus standard construction
  - Passivhaus greener construction
  - All to PH performance

Low & Negative Carbon Materials

- GBC Green Building Calculator will have many:
  - Carbon negative & Low Carbon construction methods
  - Eco versions of Passivhaus
  - IMC Innovative Methods or Construction
  - MMC Modern methods of Construction
- GBC will continue to add to them

GBC Green Building Calculator

- 892 Readymade Elemental Assemblies
  - will be added to choose from
- Each has a unique 5 cluster code made up of:
  - elemental code,
  - outer finish code,
  - core code,
  - inner finish code,
  - unique number if similar assemblies arise
- Performance code
  - 6th cluster code was planned as a performance code
  - But external envelope elements should all be Passivhaus or better

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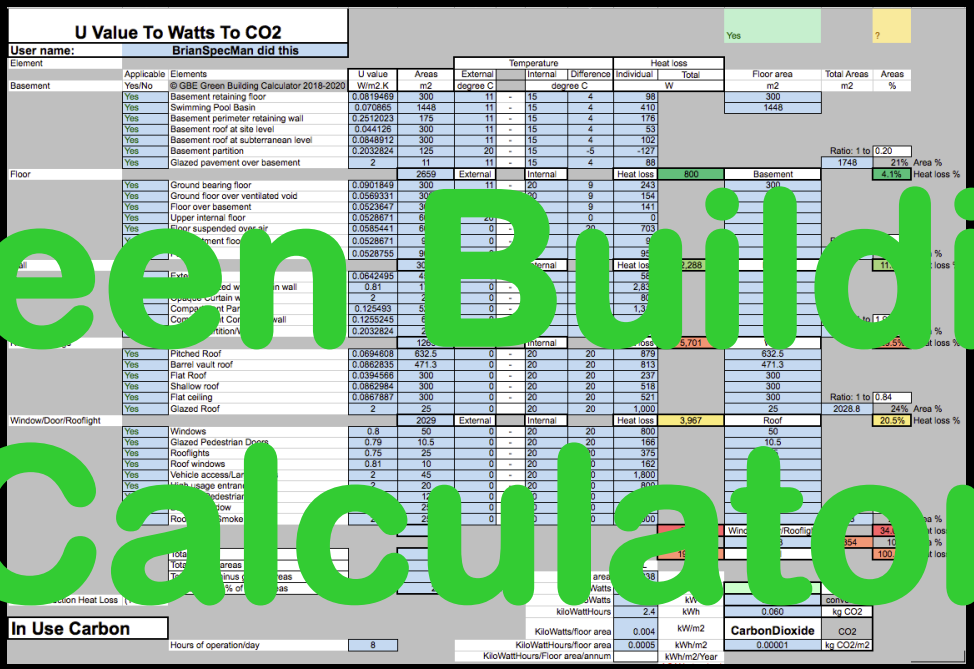


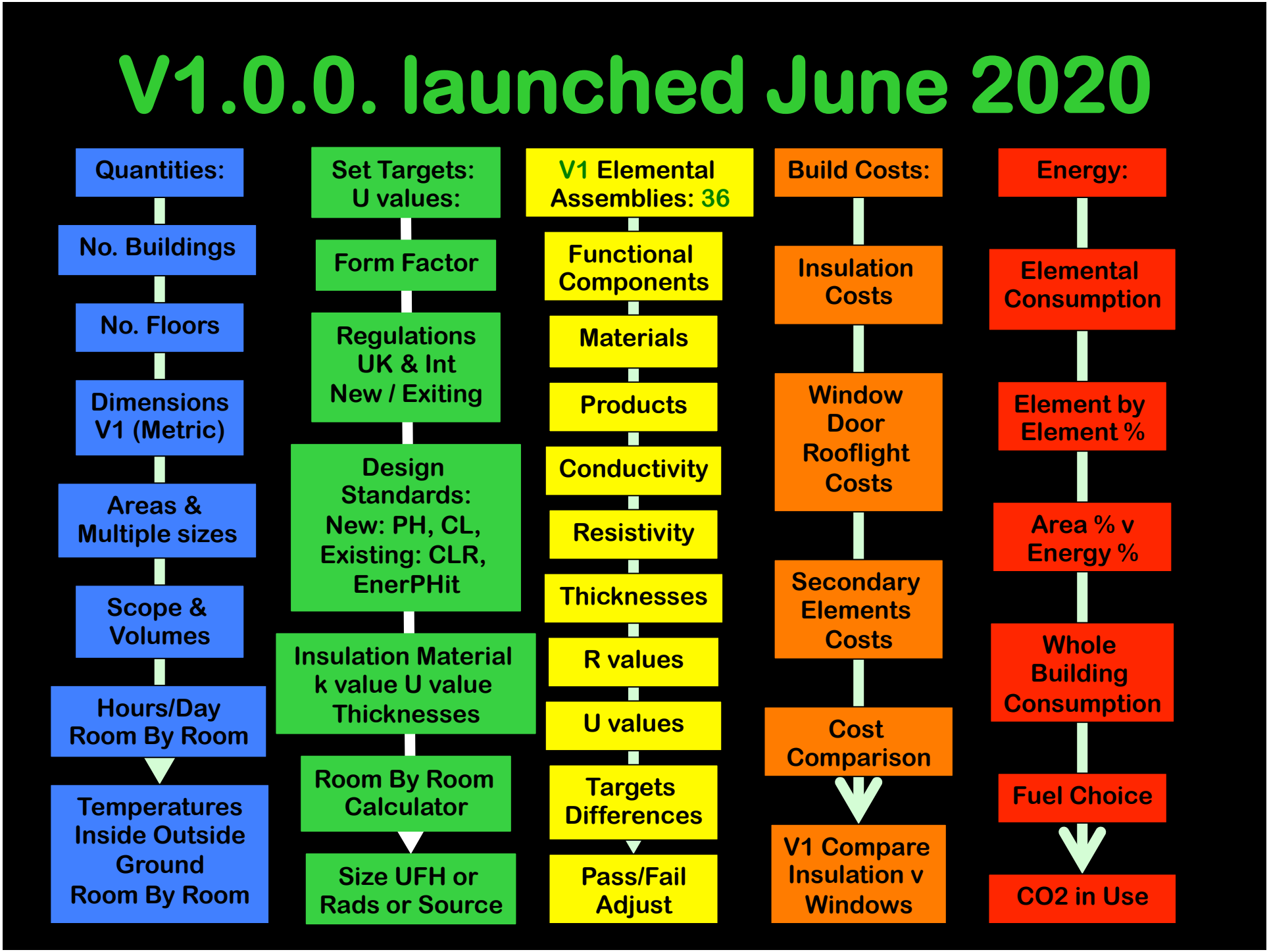
U Value To Watts To CO2

User name: BrianSpecMan did this

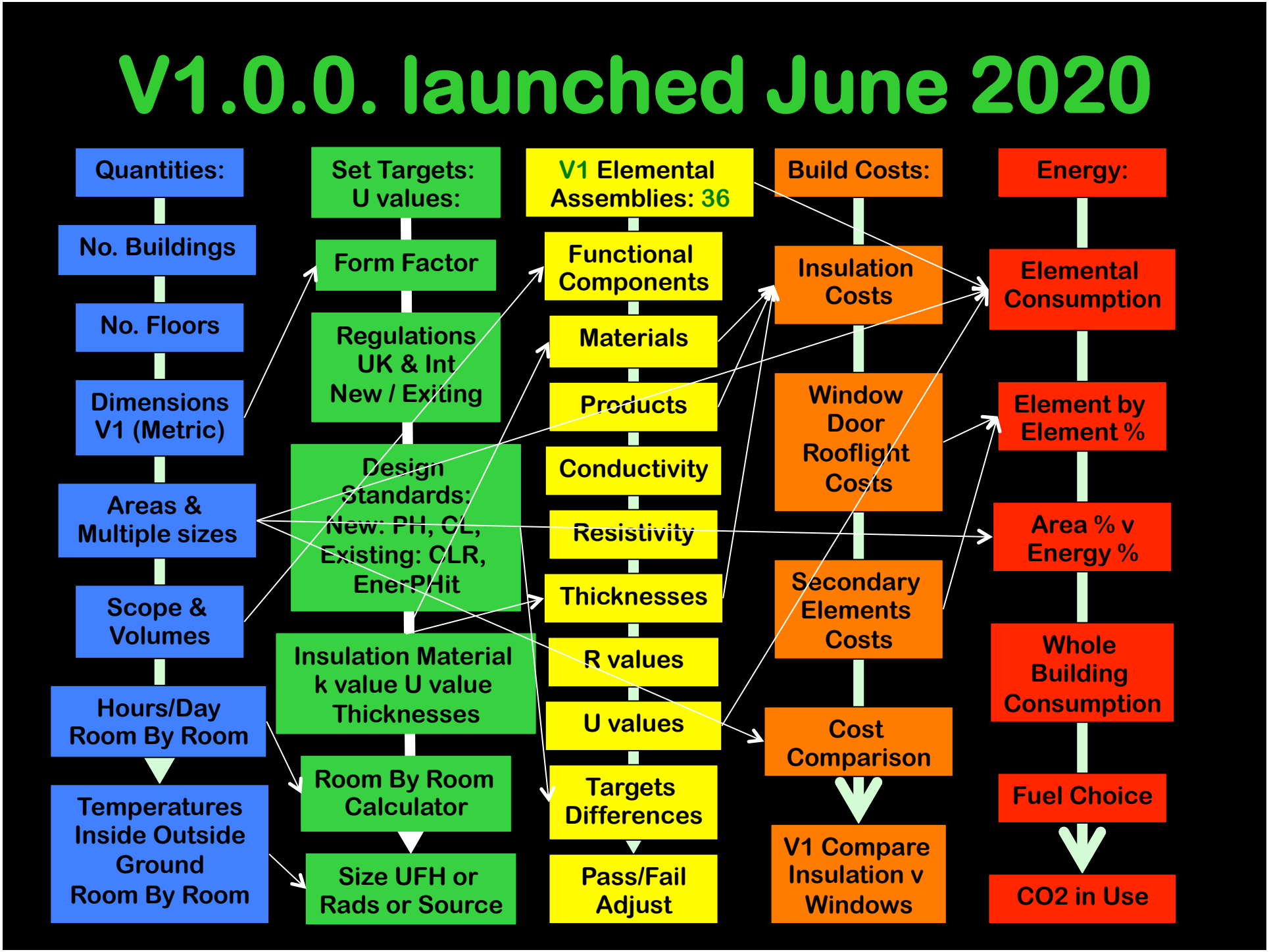
Green Building Calculator

Executive Summary

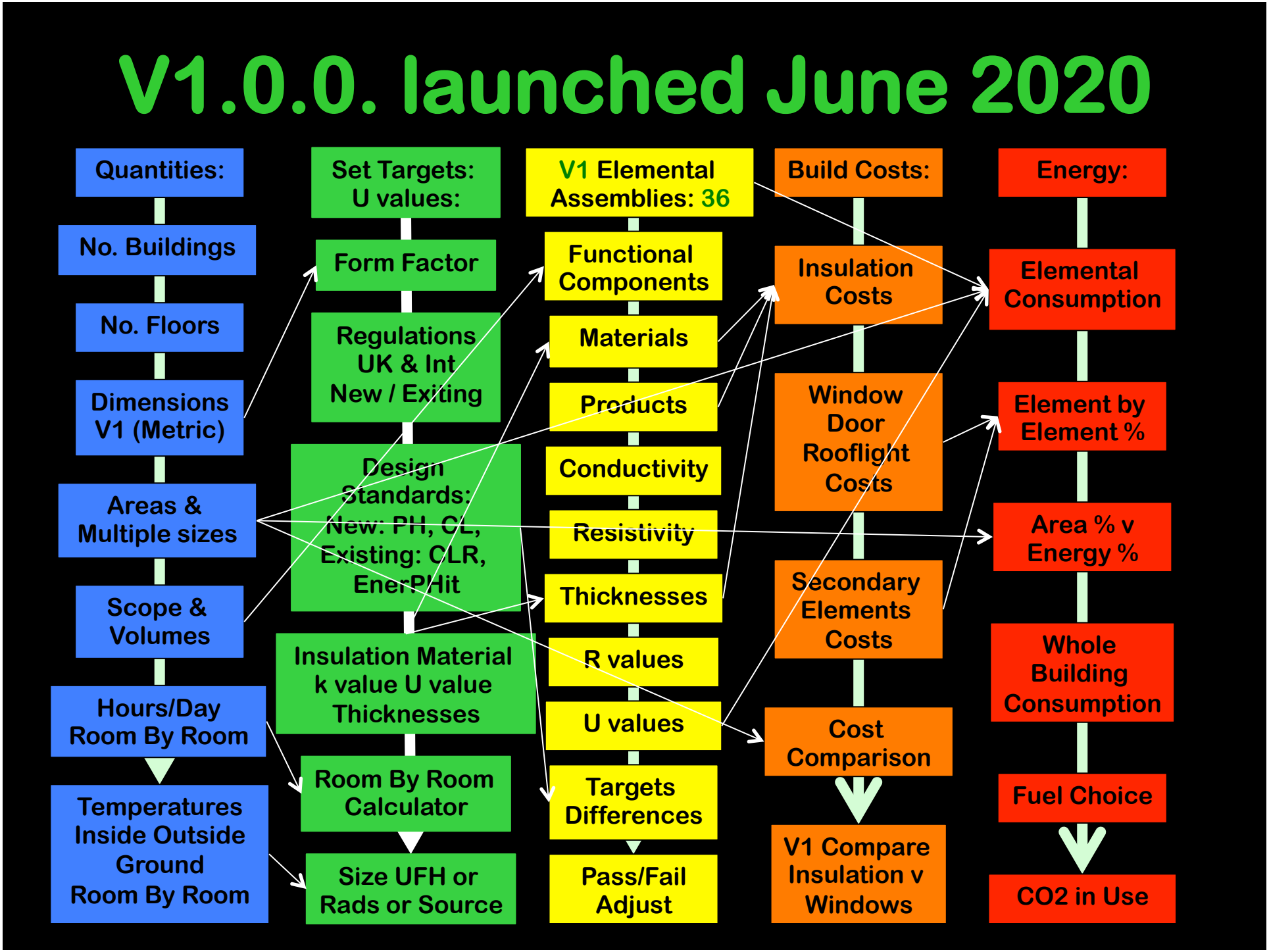
V1.0.0. launched June 2020



V1.0.0. launched June 2020



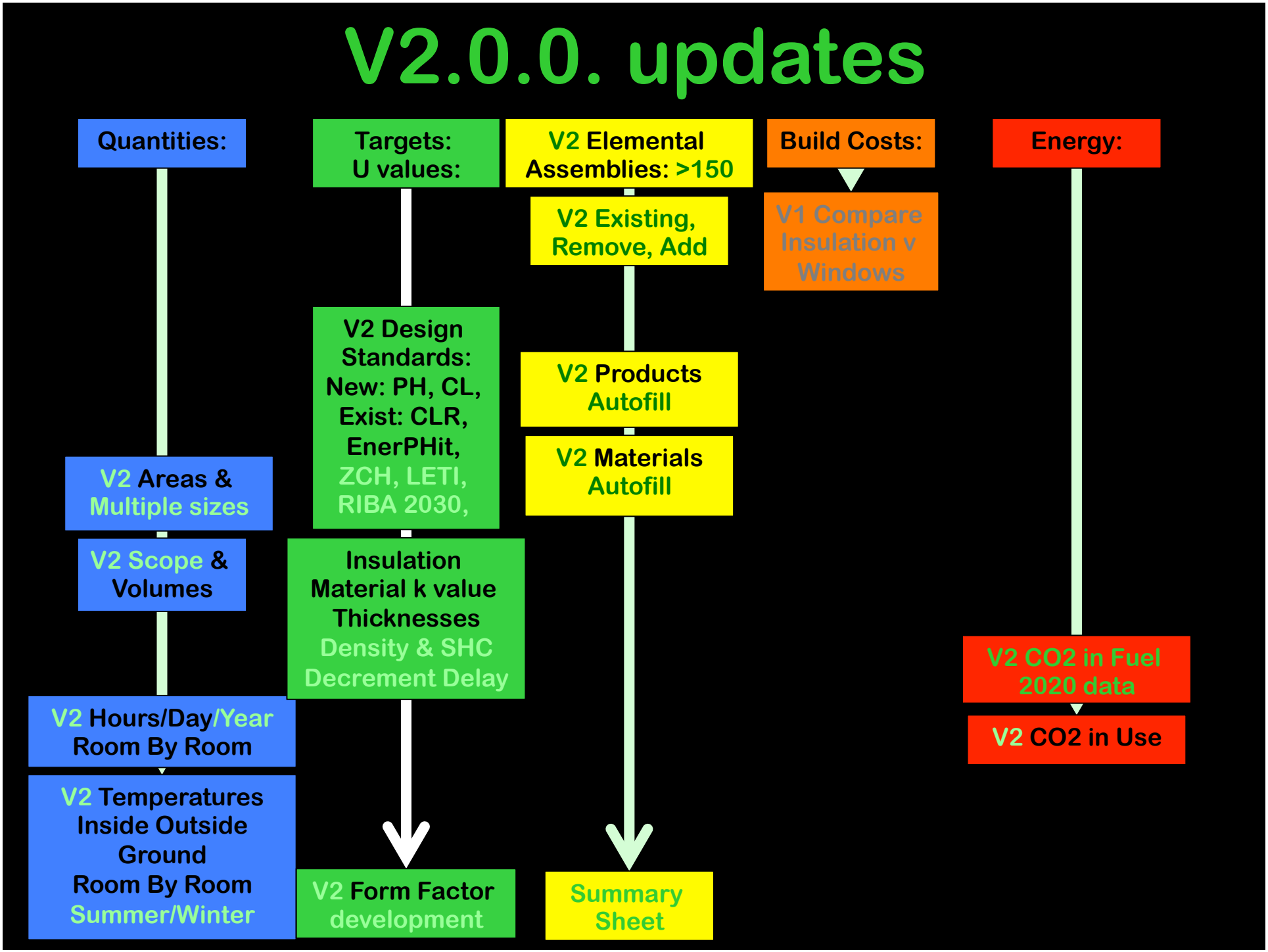
V1.0.0. launched June 2020



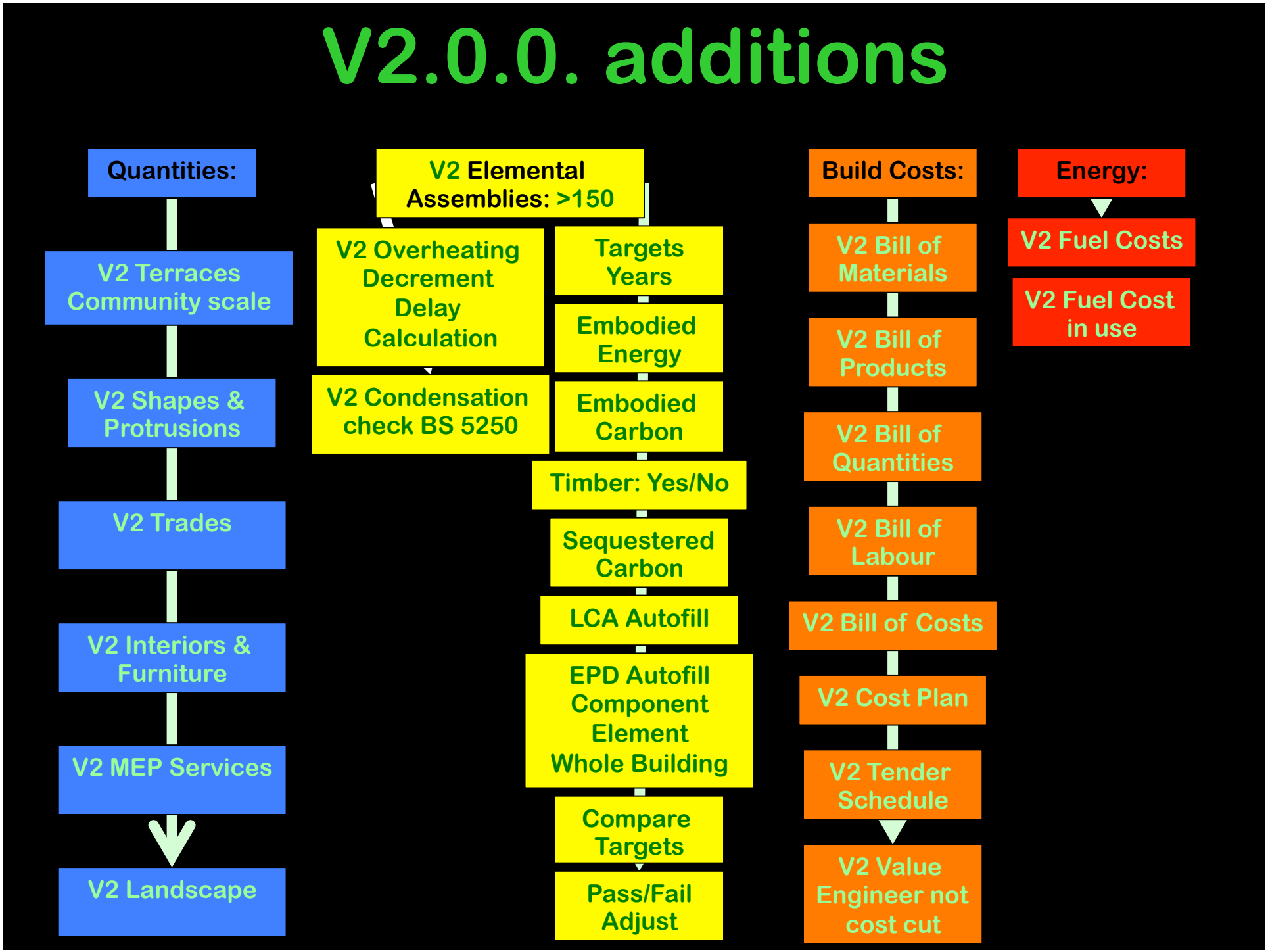
GBC Green Building Calculator

- Scope: V1.0.0. Completion:
- New Build, Domestic, Multi-storey, Multi-occupancy, Non-domestic (partial)
- Building Size:
  - Number of buildings and floors, heights, lengths, areas, volumes
- Temperatures: inside, outside, below ground and swimming pool
- Hours in use: per day (period temperatures maintained)
- Room by Room heat loss calculator: size radiators UFH or Boiler
- Form Factor: to set higher targets where necessary
- Regulations v Design standards:
  - U value target Selection:
  - Part L, Passivhaus, EnerPHit, AECB: CL or CLR or others
- Winter Thermal Insulation Material Choices
  - K values v U values = Thicknesses of different materials (50 mm is not enough)
- Assemble elements and all their components,
  - replace components with generic materials or products
  - Get U values, R values, meet targets or not, review thicknesses or materials
  - Energy Consumption, element by element %, add fuel choice > CO2 in use
  - Bill of Materials, Quantities, Labour, Products, Costs
  - Cost planning by the designer for the client investment not cost cutting

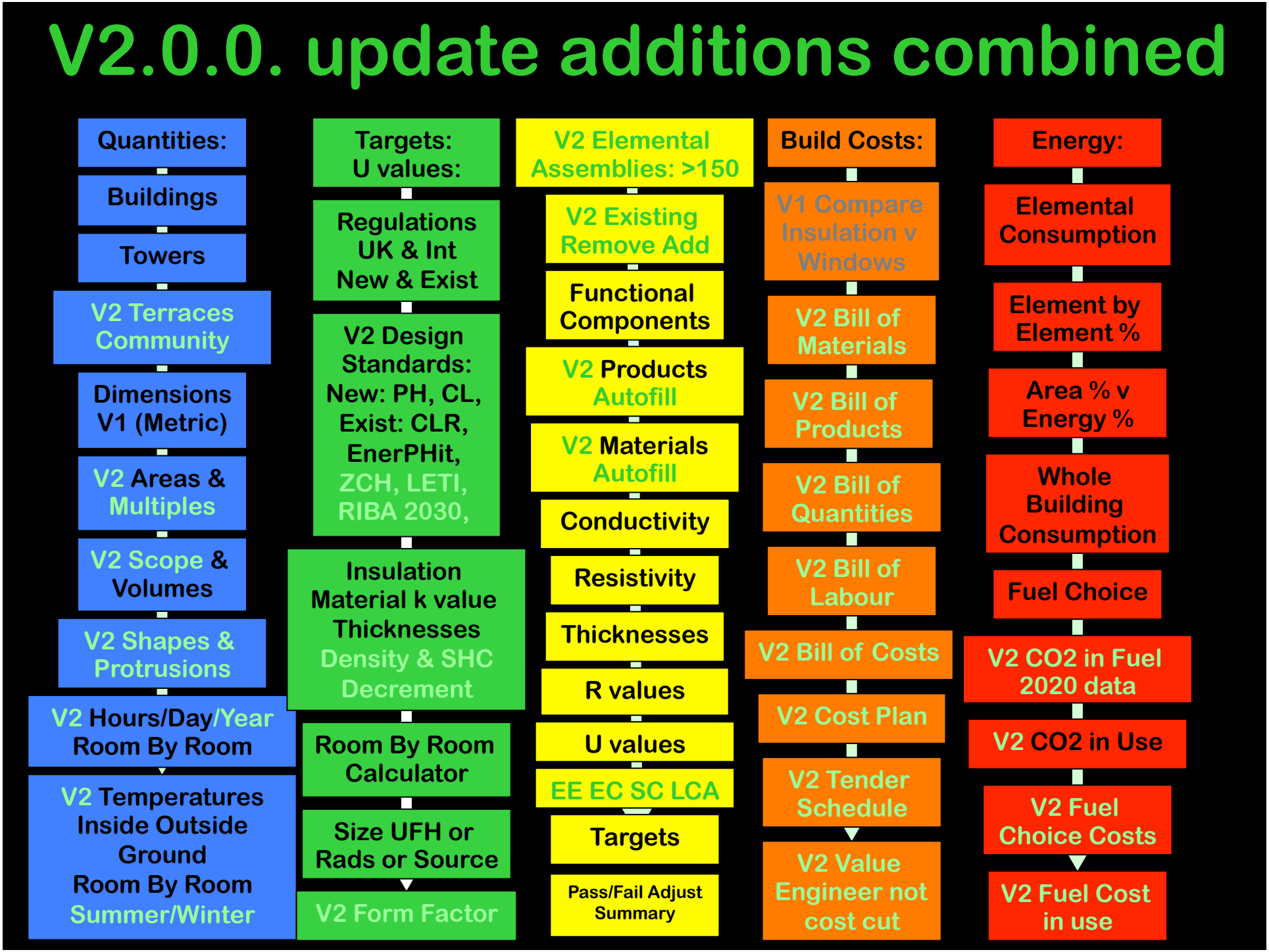
V2.0.0. updates



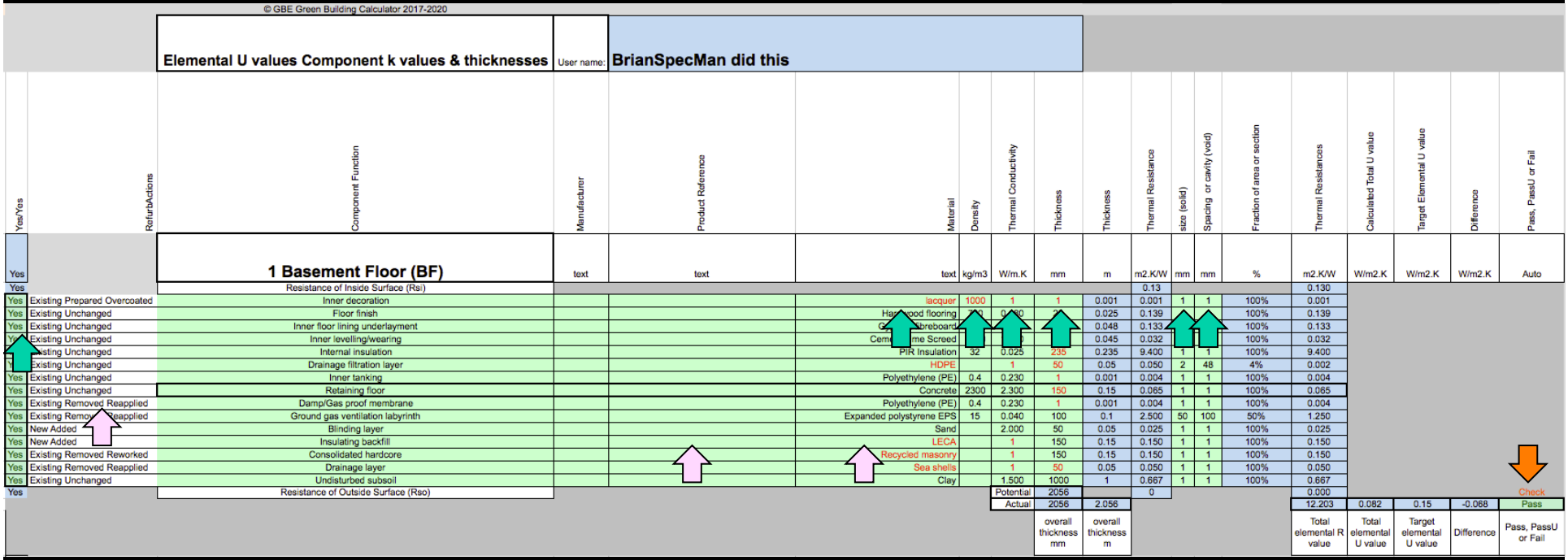
V2.0.0. additions



V2.0.0. update additions combined



V1>V2 24 of 39 Elements
U or R value
12 secondary element U/R values
Refurb Actions



© GBE Green Building Calculator 2017-2020

Elemental U values Component k values & thicknesses | User name: **BrianSpecMan did this**

Yes/Yes	RefurbActions	Component Function	Manufacturer	Product Reference	Material	Density	Thermal Conductivity	Thickness	Thickness	Thermal Resistance	size (solid)	Spacing or cavity (void)	Fraction of area or section	Thermal Resistances	Calculated Total U value	Target Elemental U value	Difference	Pass, PassU or Fail
Yes		**1 Basement Floor (BF)**	text	text	text	kg/m3	W/m.K	mm	m	m2.K/W	mm	mm	%	m2.K/W	W/m2.K	W/m2.K	W/m2.K	Auto
Yes		Resistance of Inside Surface (Rsi)								0.13				0.130				
Yes	Existing Prepared Overcoated	Inner decoration			lacquer	1000	1	1	0.001	0.001	1	1	100%	0.001				
Yes	Existing Unchanged	Floor finish			Hardwood flooring	700	0.180	25	0.025	0.139			100%	0.139				
Yes	Existing Unchanged	Inner floor lining underlayment			Gypsum fibreboard	1000	0.230	18	0.018	0.078			100%	0.078				
Yes	Existing Unchanged	Inner levelling/wearing			Cement/lime Screed	1200	0.530	75	0.075	0.142			100%	0.142				
Yes	Existing Unchanged	Internal insulation			PIR Insulation	32	0.025	235	0.235	9.400	1	1	100%	9.400				
Yes	Existing Unchanged	Drainage filtration layer			HDPE		1	50	0.05	0.050	2	48	4%	0.002				
Yes	Existing Unchanged	Inner tanking			Polyethylene (PE)	0.4	0.230	1	0.001	0.004	1	1	100%	0.004				
Yes	Existing Unchanged	Retaining floor			Concrete	2300	2.300	150	0.15	0.065	1	1	100%	0.065				
Yes	Existing Removed Reapplied	Damp/Gas proof membrane			Polyethylene (PE)	0.4	0.230	1	0.001	0.004	1	1	100%	0.004				
Yes	Existing Removed Reapplied	Ground gas ventilation labyrinth			Expanded polystyrene EPS	15	0.040	100	0.1	2.500	50	100	50%	1.250				
Yes	New Added	Blinding layer			Sand		2.000	50	0.05	0.025	1	1	100%	0.025				
Yes	New Added	Insulating backfill			LECA		1	150	0.15	0.150	1	1	100%	0.150				
Yes	Existing Removed Reworked	Consolidated hardcore			Recycled masonry		1	150	0.15	0.150	1	1	100%	0.150				
Yes	Existing Removed Reapplied	Drainage layer			Sea shells		1	50	0.05	0.050	1	1	100%	0.050				
Yes	Existing Unchanged	Undisturbed subsoil			Clay		1.500	1000	1	0.667	1	1	100%	0.667				Check
Yes		Resistance of Outside Surface (Rso)								0				0.000				
							Potential	2056										
							Actual	2056	2.056					12.203	0.082	0.15	-0.068	Pass
								overall thickness mm	overall thickness m					Total elemental R value	Total elemental U value	Target elemental U value	Difference	Pass, PassU or Fail

V1 Insulation and Windows Costs: Superseded by V2 BoM?

- Costs of insulation and windows are added here
- to help persuade architects and clients to spend money
- on insulation and higher performance windows and glazing

V1 Elements: Bill of Materials Quantities Costs

- To allow Architects to cost plan their projects
- Bill of materials, quantities, labour and costs is added based on building fabric only so far.
- User add their own researched prices
- Recent tenders for labour rates

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V2 Bill of Materials

Bill of Materials Quantities Costs

SFCA 4th Edition

Detailed (Elemental) Cost Analysis (+ optional Components)

	Component Function	Refurb Actions	Material	Area GIFA	Labour rate	Labour Cost	Materials rate	Materials Cost	Total Cost
Yes	1 Basement Floor (BF)			m2	£/m2	£	£/m2	£	£
				60	1 Basement Floor (BF)				
Yes	Inner decoration	Existing Prepared Overcoated	lacquer	60	£0.00	£0	£0.00	£0	£0
Yes	Floor finish	Existing Unchanged	Hardwood flooring	60	£0.00	£0	£0.00	£0	£0
Yes	Inner floor lining underlayment	Existing Unchanged	Gypsum fibreboard	60	£0.00	£0	£0.00	£0	£0
Yes	Inner levelling/wearing	Existing Unchanged	Cement Lime Screed	60	£0.00	£0	£0.00	£0	£0
Yes	Internal insulation	Existing Unchanged	PIR Insulation	60	£1.00	£0	£1.00	£60	£60
Yes	Drainage filtration layer	Existing Unchanged	HDPE	60	£0.00	£0	£0.00	£0	£0
Yes	Inner tanking	Existing Unchanged	Polyethylene (PE)	60	£0.00	£0	£0.00	£0	£0
Yes	Retaining floor	Existing Unchanged	Concrete	60	£1.00	£60	£0.00	£0	£60
Yes	Damp/Gas proof membrane	Existing Removed Reapplied	Polyethylene (PE)	60	£0.00	£0	£0.00	£0	£0
Yes	Ground gas ventilation labyrinth	Existing Removed Reapplied	Expanded polystyrene EPS	60	£0.00	£0	£1.00	£60	£60
Yes	Blinding layer	New Added	Sand	60	£0.00	£0	£0.00	£0	£0
Yes	Insulating backfill	New Added	LECA	60	£0.00	£0	£1.00	£60	£60
Yes	Consolidated hardcore	Existing Removed Reworked	Recycled masonry	60	£0.00	£0	£0.00	£0	£0
Yes	Drainage layer	Existing Removed Reapplied	Sea shells	60	£0.00	£0	£0.00	£0	£0
Yes	Undisturbed subsoil	Existing Unchanged	Clay	60	£0.00	£0	£0.00	£0	£0

£1.00	£3.00	£4.00	£60	£180	£240
Elemental Labour Cost per m2	Elemental Materials Cost per m2	Elemental Total Cost per m2	Elemental Labour Cost	Elemental Material Costs	Elemental Cost Materials & Labour

Elements (and otional Components)	Total Cost	Cost per m2 GIFA (Gross Internal Floor Area)	Unit Quantity		Unit rate (Cost per No.)
	£	£/m2	m2 or No.	m2 or No.	£/No.
1 Substructure	£480.00	£8.00	60	m2	£7.00

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V2 Bill of Materials (BoM)

- Being added:
  - Non-envelope items,
  - Services
- V? National Building Price book datasets?
  - But they are part of BAU
  - ‘race to the bottom’

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V20.0.0. Future Development

- Green Building Price Book
  - Proposed 18 years ago
  - But proposal rejected by publishers
  - Discussions started
- Embedded in GBC V 20.0.0.
- Products and Materials sheets
  - Add costs
  - Add rates

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V2 EE EC SC

Embodied Energy To Sequestered Carbon	m	m	m	m	No.	m2	m3					Mj/m3	MJ/m2	MJ/Item	m2	m2	kg C/kg	kg CO2/kg	kg CO2/m2	kg CO2/Item	kg/m3	kg/m2	MJ/m3	kg CO2/m3	Yes/No	MJ	kg CO2	Yes/No	kg CO2	Kg CO2
																									Grand totals	#N/A	#N/A	0	0	#N/A
Component Function	Length	Width	Height	Element Thickness	Quantity	Areas	Volume	Primary or all Functions	Primary or all Components	Primary or all Materials	Information Source	Embodied Energy	Embodied Energy	Embodied Energy	Area or section	m2	Embodied Carbon	Embodied Carbon Dioxide	Embodied Carbon Dioxide	Embodied Carbon Dioxide	Density	Weight	Embodied Energy	Embodied Carbon Dioxide	Required in building?	Embodied Energy Building	Embodied Carbon Building	Does Column BE include timber?	Sequestered carbon	Total Carbon
Yes	1 Basement Floor (BF)					60																								
Yes	Inner decoration			0.001	1	60	0.06	Decoration	Ground beams/ties/spacers	Paint (2 coats)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	Yes	#N/A	#N/A	No	0	#N/A
Yes	Floor finish			0.025	1	60	1.5	Finish	Ground beams/ties/spacers	Paint (2 coats)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	Yes	#N/A	#N/A	No	0	#N/A
Yes	Inner floor lining underlayment			0.048	1	60	2.88	Lining/Sheathing/Sarking	Ground beams/ties/spacers	Paint (2 coats)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	Yes	#N/A	#N/A	No	0	#N/A
Yes	Inner levelling/wearing			0.045	1	60	2.7	Gap filler / Formation	Ground beams/ties/spacers	Paint (2 coats)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	Yes	#N/A	#N/A	No	0	#N/A
Yes	Internal insulation			0.235	1	60	14.1	Thermal Insulation	Ground beams/ties/spacers	Paint (2 coats)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	Yes	#N/A	#N/A	No	0	#N/A
Yes	Drainage filtration layer			0.05	1	60	3	Loadbearing capacity: Foundation	Ground beams/ties/spacers	Paint (2 coats)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	Yes	#N/A	#N/A	No	0	#N/A
Yes	Inner tanking			0.001	1	60	0.06	Ground water exclusion	Ground beams/ties/spacers	Paint (2 coats)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	Yes	#N/A	#N/A	No	0	#N/A
Yes	Retaining floor			0.15	1	60	9	Loadbearing capacity: Basement	Ground beams/ties/spacers	Paint (2 coats)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	Yes	#N/A	#N/A	No	0	#N/A
Yes	Damp/Gas proof membrane			0.001	1	60	0.06	Ground gas exclusion	Ground beams/ties/spacers	Paint (2 coats)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	Yes	#N/A	#N/A	No	0	#N/A
Yes	Ground gas ventilation labyrinth			0.1	1	60	6	Cross ventilation (below floor)	Ground beams/ties/spacers	Paint (2 coats)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	Yes	#N/A	#N/A	No	0	#N/A
Yes	Blinding layer			0.05	1	60	3	Gap filler / Formation	Ground beams/ties/spacers	Paint (2 coats)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	Yes	#N/A	#N/A	No	0	#N/A
Yes	Insulating backfill			0.15	1	60	9	Thermal Insulation	Ground beams/ties/spacers	Paint (2 coats)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	Yes	#N/A	#N/A	No	0	#N/A
Yes	Consolidated hardcore			0.15	1	60	9	Gap filler / Formation	Ground beams/ties/spacers	Paint (2 coats)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	Yes	#N/A	#N/A	No	0	#N/A
Yes	Drainage layer			0.05	1	60	3	Loadbearing capacity: Foundation	Ground beams/ties/spacers	Paint (2 coats)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	Yes	#N/A	#N/A	No	0	#N/A
Yes	Undisturbed subsoil			1	1	60	60	Loadbearing capacity: Foundation	Ground beams/ties/spacers	Paint (2 coats)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	Yes	#N/A	#N/A	No	0	#N/A

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V2 LCA EPD (Dev)

BS EN 15804:2012 A1 A2

Whole Building Life Cycle Analysis		m	m	m	m	No.	m2	m3																		kg CO2 equiv	kg CFC 11 equiv	kg SO2 equiv	kg (PO4)3- equiv	kg Ethene equiv	kg Sb equiv	MJ, net calorific value
	Component Function	Length	Width	Height	Element Thickness	Quantity	Areas	Volume	Product: Raw Materials Supply	Product: Transport	Product: Manufacturing	Construction: Transport	Construction: Installation	Use: Use	Use: Maintenance	Use: Repair	Use: Replacement	Use: Refurbishment	Use: Energy	Use: Water	EndOfLife: Deconstruction Demolition	EndOfLife: Transport	EndOfLife: Waste Processing	EndOfLife: Disposal	Beyond Building Life Potential: Reuse Recovery Recycling	Global warming potential (GWP)	Ozone Depletion Potential (ODP) of the stratospheric ozone layer	Acidification potential (AP) of soil & water	Eutrophication Potential (EP)	Photochemical Tropospheric Ozone creation: (POCP)	Abiotic Depletion Potential for non-fossil fule resources	Abiotic Depletion Potential of resources-fossil fuels
Yes	**1 Basement Floor (BF)**						0		A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	GWP	ODP	AP	EP	POCP	ADP Elements	ADP Fossil Fuels
									Yes	Yes	Yes	Yes	Yes									Yes		?	?							
Yes	Inner decoration				1	1	0	0																								
Yes	Floor finish				0.18	1	0	0																								
Yes	Inner floor lining underlayment				0.36	1	0	0																								
Yes	Inner levelling/wearing				1.4	1	0	0																								
Yes	Internal insulation				0.03	1	0	0																								
Yes	Drainage filtration layer				1	1	0	0																								
Yes	Inner tanking				0.23	1	0	0																								
Yes	Retaining floor				2.3	1	0	0																								
Yes	Damp/Gas proof membrane				0.23	1	0	0																								
Yes	Ground gas ventilation labyrinth				0.04	1	0	0																								
Yes	Blinding layer				2	1	0	0																								
Yes	Insulating backfill				1	1	0	0																								
Yes	Consolidated hardcore				1	1	0	0																								
Yes	Drainage layer				1	1	0	0																								
Yes	Undisturbed subsoil				1.5	1	0	0																								

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V1 Products:

- Lists of manufacturers
- Products
- Dimensions
- Characteristics
- Applications

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V1 Properties of Products

Products

CAWS+	Elements	Component/Function	Format	Supplier	Manufacturer	Product Reference	Material	Density	Thermal Conductivity	Thickness	Thickness	Thermal resistance	Width or thickness (solid)	Spacing or cavity (Void)	Fraction of area or section	Thermal resistance	U value on own	Source	Source	Year	Updated
P10		Insulation	board	Ecological Building Systems	Gutex	Ultratherm	Wood Fibre	180	0.042	50	0.05	1.190	1	1	100%	1.190	0.840	EBS 2018	Supplier	2018	24/05/2020
P10		Insulation	board	Ecological Building Systems	Gutex	Ultratherm	Wood Fibre	180	0.042	60	0.06	1.429	1	1	100%	1.429	0.700	EBS 2018	Supplier	2018	24/05/2020
P10		Insulation	board	Ecological Building Systems	Gutex	Ultratherm	Wood Fibre	180	0.042	80	0.08	1.905	1	1	100%	1.905	0.525	EBS 2018	Supplier	2018	24/05/2020
P10		Insulation	board	Ecological Building Systems	Gutex	Ultratherm	Wood Fibre	180	0.042	100	0.1	2.381	1	1	100%	2.381	0.420	EBS 2018	Supplier	2018	24/05/2020
P10		Insulation	Board	Ecological Building Systems	Gutex	Multitherm	Wood Fibre	140	0.040	40	0.04	1.000	1	1	100%	1.000	1.000	EBS 2018	Supplier	2018	24/05/2020
P10		Insulation	Board	Ecological Building Systems	Gutex	Multitherm	Wood Fibre	140	0.040	60	0.06	1.500	1	1	100%	1.500	0.667	EBS 2018	Supplier	2018	24/05/2020
P10		Insulation	Board	Ecological Building Systems	Gutex	Multitherm	Wood Fibre	140	0.040	80	0.08	2.000	1	1	100%	2.000	0.500	EBS 2018	Supplier	2018	24/05/2020
P10		Insulation	Board	Ecological Building Systems	Gutex	Thermoroom	Wood Fibre	130	0.039	20	0.02	0.513	1	1	100%	0.513	1.950	EBS 2018	Supplier	2018	24/05/2020
P10		Insulation	Board	Ecological Building Systems	Gutex	Thermoroom	Wood Fibre	130	0.039	40	0.04	1.026	1	1	100%	1.026	0.975	EBS 2018	Supplier	2018	24/05/2020
P10		Insulation	Board	Ecological Building Systems	Gutex	Thermoroom	Wood Fibre	130	0.039	60	0.06	1.538	1	1	100%	1.538	0.650	EBS 2018	Supplier	2018	24/05/2020
P10		Insulation	Board	Ecological Building Systems	Gutex	Thermoroom	Wood Fibre	130	0.039	80	0.08	2.051	1	1	100%	2.051	0.488	EBS 2018	Supplier	2018	24/05/2020
P10		Insulation	Board	Ecological Building Systems	Gutex	Thermoroom	Wood Fibre	130	0.039	100	0.1	2.564	1	1	100%	2.564	0.390	EBS 2018	Supplier	2018	24/05/2020
P10	Flat roof	Insulation	Board and bonded insulation	Direct from Manufacturer	Kingspan	Thermaroof TR31	6 mm ply and 120 Insulation			120	0.12	#DIV/0!	1	1	100%	#DIV/0!	#DIV/0!	LSBU EREID 2017	manufacturer	2017	24/05/2020
P10	Flat roof	Insulation	Rigid Board insulation	Direct from Manufacturer	Kingspan	Thermapitch TP10			0.022	160.0	0.06	2.727272727	1	1	100%	2.727272727	0.367	LSBU EREID 2017	manufacturer	2017	24/05/2020
P10			Rigid Board insulation	Direct from Manufacturer	Kingspan	Thermapitch TP10			0.042	40.0	0.04	0.952380952	1	1	100%	0.952380952	1.050	LSBU EREID 2017	manufacturer	2017	24/05/2020
P10	External wall	Thermal insulation		Direct from Manufacturer	Kooltherm	Rigid Insulation			0.018	100.0	0.1	5.555555556	1	1	100%	5.555555556	0.180	LSBU EREID 2017	manufacturer	2017	24/05/2020
P10		Insulation	Board	Direct from Manufacturer	Steico	SteicoTherm	Rigid wood fibre		0.038	220	0.22	5.789473684	1	1	100%	5.789473684	0.173	LSBU EREID 2017	manufacturer	2017	24/05/2020
P10		Insulation	Board	Direct from Manufacturer	Steico	SteicoTherm	Rigid wood fibre		0.038	200	0.2	5.263157895	1	1	100%	5.263157895	0.190	LSBU EREID 2017	manufacturer	2017	24/05/2020
P10		Insulation	Board	Direct from Manufacturer	Steico	SteicoTherm	Rigid wood fibre		0.038	30	0.03	0.789473684	2	1	100%	0.789473684	1.267	LSBU EREID 2017	manufacturer	2017	24/05/2020
P10		Insulation	Board	Direct from Manufacturer	Steico	SteicoTherm	Rigid wood fibre		0.038	100	0.1	2.631578947	2	1	100%	2.631578947	0.380	LSBU EREID 2017	manufacturer	2017	24/05/2020
P10		Insulation	Quilt	Ecological Building Systems	Thermafleece	Cosywool	Wool	18	0.039	100	0.1	2.564	1	1	100%	2.564	0.390	EBS 2018	Supplier	2018	24/05/2020
P10		Insulation	Quilt	Ecological Building Systems	Thermafleece	Cosywool	Wool	18	0.039	75	0.075	1.923	1	1	100%	1.923	0.520	EBS 2018	Supplier	2018	24/05/2020
P10		Insulation	Quilt	Ecological Building Systems	Thermafleece	Cosywool	Wool	18	0.039	50	0.05	1.282	1	1	100%	1.282	0.780	EBS 2018	Supplier	2018	24/05/2020
P10		Insulation	Quilt	Ecological Building Systems	Thermafleece	Cosywool	Wool	18	0.039	140	0.14	3.590	1	1	100%	3.590	0.279	EBS 2018	Supplier	2018	24/05/2020
P10		Insulation	Flexible Matts	Ecological Building Systems	ThermoNatur	Thermahemp Premium	Hemp	38	0.040	40	0.04	1.000	1	1	100%	1.000	1.000	EBS 2018	Supplier	2018	24/05/2020
P10		Insulation	Flexible Matts	Ecological Building Systems	ThermoNatur	Thermahemp Premium	Hemp	38	0.040	60	0.06	1.500	1	1	100%	1.500	0.667	EBS 2018	Supplier	2018	24/05/2020
P10		Insulation	Flexible Matts	Ecological Building Systems	ThermoNatur	Thermahemp Premium	Hemp	38	0.040	80	0.08	2.000	1	1	100%	2.000	0.500	EBS 2018	Supplier	2018	24/05/2020
P10		Insulation	Flexible Matts	Ecological Building Systems	ThermoNatur	Thermahemp Premium	Hemp	38	0.040	100	0.1	2.500	1	1	100%	2.500	0.400	EBS 2018	Supplier	2018	24/05/2020
P10		Insulation	Flexible Matts	Ecological Building Systems	ThermoNatur	Thermahemp Premium	Hemp	38	0.040	140	0.14	3.500	1	1	100%	3.500	0.286	EBS 2018	Supplier	2018	24/05/2020
P10	Floor	Impact Sound Isolation	Sheet	Direct from Manufacturer		ISO Rubber			0.075	6	0.006	0.08	1	1	100%	0.08	12.500	LSBU EREID 2017	manufacturer	2017	24/05/2020
P10				Direct from Manufacturer		Lambatherm	Sheep's wool		0.03	172.0	0.172	5.733333333	1	1	100%	5.733333333	0.174	LSBU EREID 2017	manufacturer	2017	24/05/2020
P10	Flooring	Thermal Insulation		Direct from Manufacturer		Earthwool Building Slab RS140	Mineral wool		0.034	150.0	0.15	4.411764706	1	1	100%	4.411764706	0.227	LSBU EREID 2017	manufacturer	2017	24/05/2020
P10			Board	NBT		Pavatex			0.04	300.0	0.3	7.5	1	1	100%	7.5	0.133	LSBU EREID 2017	manufacturer	2017	24/05/2020
P11	External Wall	Thermal Insulation	Foam	Direct from Manufacturer	Icynene	Spray foam Insulation	Polyurethane	8	0.04	40	0.04	1.000	550	600	92%	0.917	1.000	ND LSBU EREID 2018	manufacturer	2018	24/05/2020
P14	External Wall	Air tightness layer	Membrane	Ecological Building Systems	Proclima	Intello Plus	Polyolephene	-	0.17	0.5	0.0005	0.003	1	1	100%	0.003	340.000	ND LSBU EREID 2018	manufacturer	2018	24/05/2020
P14	External Wall	Wind tightness layer	Membrane	Ecological Building Systems	Proclima	Solitex Fronta	Polyolephene	-	0.2	0.1	0.0001	0.001	1	1	100%	0.001	2000.000	ND LSBU EREID 2018	manufacturer	2018	24/05/2020

GBE

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V2 > V3 Products

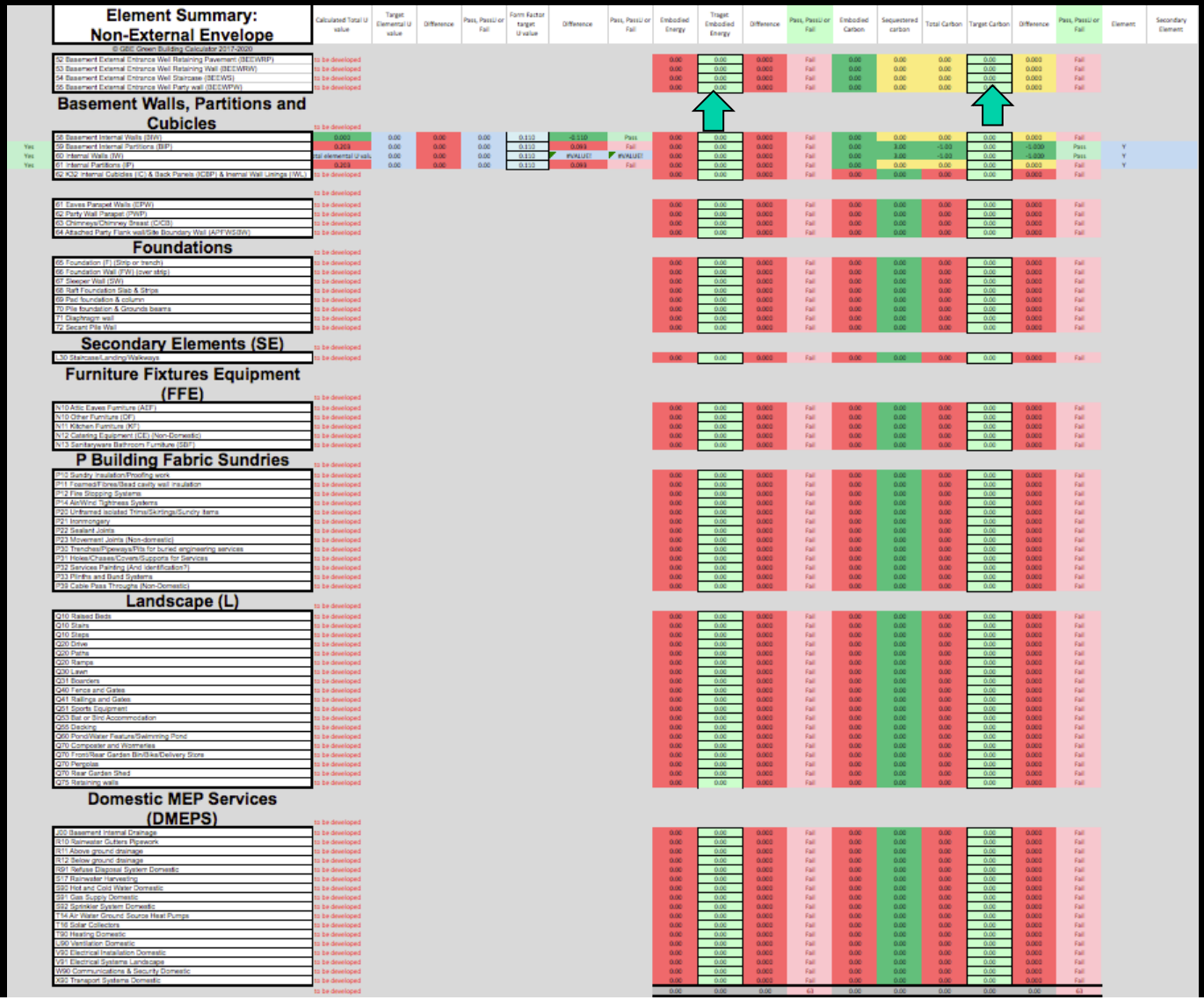
- Becomes a Look Up Table to populate 'Elements: Components'
- GBC to only permit them to be chosen as intended by manufacturer
- V1 Users can still overwrite
  - but consciously
- V3 GBC shall prevent it (Protect GBC)
- V20 Green Building Price Book

V2 Element Summary Ext Env For U Value Calculations

	Element Summary: External Envelope	Calculated Total U value	Target Elemental U value	Difference	Pass, PassU or Fail	Form Factor target U value	Difference	Pass, PassU or Fail	Embodied Energy	Traget Embodied Energy	Difference	Pass, PassU or Fail	Embodied Carbon	Sequestered carbon	Total Carbon	Target Carbon	Difference	Pass, PassU or Fail	Element	Secondary Element
	© GBE Green Building Calculator 2017-2020	W/m2.K	W/m2.K	W/m2.K	%%%	W/m2.K	W/m2.K												Y	Y
Yes	1 Basement Floor (BF)	0.082	0.15	-0.07	Pass	0.110	-0.028	Pass	0.00	0.00	0.000	Fail	1.00	-1.00	0.00	0.00	0.000	Fail	Y	
Yes	2 Basement Perimeter Retaining Walls (BPRW)	0.251	0.15	0.10	Fail	0.110	0.141	Fail	0.00	0.00	0.000	Fail	2.00	1.00	1.00	0.00	1.000	Fail	Y	
Yes	3 Basement External Wall (BEW)	0.064	0.15	-0.09	Pass	0.110	-0.046	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	4 Basement Roof at Site Level (BRSL)	0.044	0.15	-0.11	Pass	0.110	-0.066	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	5 Basement Roof at SubTerranean level (BRSTL)	0.085	0.15	-0.07	Pass	0.110	-0.025	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	6 Basement Overhead Glazed Pavement (BOGP)	2.000	0.750	1.250	Fail	0.110	1.890	Fail	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	7 Swimming Pool Basin (SPB)	0.071	0.15	-0.08	Pass	0.110	-0.039	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	8 Ground Floor Over Basement (GFOB)	0.052	0.15	0.15	Fail	0.110	-0.058	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	9 Ground Floor Ground Bearing (GFGB)	0.090	0.15	-0.06	Pass	0.110	-0.020	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	10 Ground Floor Over Ventilated Void (GFOV)	0.057	0.150	-0.093	Pass	0.110	-0.053	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	11 Upper Floor (UF)	0.102	0.15	0.15	Fail	0.110	-0.008	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	13 External Floor & Soffit (EFS) (over air)	0.059	0.150	-0.091	Pass	0.110	-0.051	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	14 Top Floor (TF)	0.118	0.75	-0.63	Pass	0.110	0.008	Fail	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	15 Party Floor (PF)	0.053	0.150	-0.097	Pass	0.110	-0.057	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	16 Party Wall (PW)	0.125	0.300	-0.175	Pass	0.110	0.015	Fail	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	17 Communal Compartment Floors (CCF)	0.053	0.15	-0.10	Pass	0.110	-0.057	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	18 Communal Compartment Wall (CCW)	0.126	0.300	-0.174	Pass	0.110	0.016	Fail	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	20 External Walls (EW)	0.064	0.15	-0.09	Pass	0.110	-0.046	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	21 Integral Unheated Space Wall (IUSW)	0.064	0.75	-0.69	Pass	0.110	-0.046	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	22 Flat Roof (FR)	0.039	0.150	-0.111	Pass	0.110	-0.071	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	23 Shallow Roof (SR)	0.086	0.150	-0.064	Pass	0.110	-0.024	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	24 Pitched Roof (PR)	0.069	0.150	-0.081	Pass	0.110	-0.041	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	25 Barrel Vault Roof (BVR)	0.086	0.150	-0.064	Pass	0.110	-0.024	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	26 Domed Roof (DR)	0.049	0.150	-0.101	Pass	0.110	-0.061	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	25 Hipped/Pyramid Roof (HPR)	0.070	0.00	0.070	Fail	0.110	-0.040	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	26 Mono-Pitched Roof (MPR)	0.070	0.00	0.070	Fail	0.110	-0.040	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	27 Mansard Roof (MR)	0.070	0.000	0.070	Fail	0.110	-0.040	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	28 Dormer Flat Roofs (DFR)	0.070	0.00	0.070	Fail	0.110	-0.040	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	29 Dormer Side Wall (DSW)	0.070	0.00	0.070	Fail	0.110	-0.040	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	30 Dormer Window Wall (DWW)	0.070	0.00	0.070	Fail	0.110	-0.040	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	31 Other Geometry Roof (OGR)	0.070	0.00	0.070	Fail	0.110	-0.040	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	34 Flat Ceiling (FC)	0.087	0.150	-0.063	Pass	0.110	-0.023	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	33 Pitched Vault Ceiling (PVC)	0.089	0.000	0.000	Pass	0.110	-0.021	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	34 Barrel Vault Ceiling (BVC)	0.089	Unregulated	N/A	PassU	0.110	-0.021	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	35 Domed Vault Ceiling (DVC)	0.089	0.000	0.000	Pass	0.110	-0.021	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	36 Hipped/Pyramid Vault Ceiling (HPVC)	0.089	0.000	0.000	Pass	0.110	-0.021	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	37 Mono-Pitch Vault Ceiling (MPVC)	0.089	0.000	0.000	Pass	0.110	-0.021	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	38 Mansard Vault Ceiling (MVC)	0.089	0.000	0.000	Pass	0.110	-0.021	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	39 Other Geometry Ceiling (OGC)	0.089	0.000	0.000	Pass	0.110	-0.021	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
Yes	42 Windows (W)	0.800	0.950	-0.150	Pass		0.800		0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		Y
Yes	43 Glazed Pedestrian Doors (GPD)	0.790	0.950	-0.160	Pass		0.790		0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		Y
Yes	44 Opaque Pedestrian Doors (OPD)	2.000	0.750	1.250	Fail		2.000		0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		Y
Yes	45 Large Wall Opening (LWO)	2.000	0.750	1.250	Fail		2.000		0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		Y
Yes	46 High Usage Entrance Door (HUED)	2.000	0.750	1.250	Fail		2.000		0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		Y
Yes	47 Display Window (DW)	2.000	0.950	1.050	Fail		2.000		0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		Y
Yes	48 Glazed External Walls (GEW)	0.810	0.950	-0.140	Pass		0.810		0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		Y
Yes	49 Opaque External Walls (OEW)	2.000	0.750	1.250	Fail		2.000		0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		Y
Yes	50 Glazed Roof (GR)	2.000	0.950	1.050	Fail		2.000		0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		Y
Yes	51 Rooflights (RL)	0.750	0.950	-0.200	Pass		0.750		0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		Y
Yes	52 Roof Windows (RW)	0.810	0.950	-0.140	Pass		0.810		0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		Y
Yes	53 Roof Air & Smoke Vents (RASV)	2.000	0.750	1.250	Fail		2.000		0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		Y
			16.25			4.29			0.00	0.00	0.00		3.00	0.00	1.00	0.00	1.00		24	12
				51	18	of 51		5				51						51		
					Fail			Fail				Fail						Fail		
					32	of 51		34	of 51			0	of 51					0	of 51	
					Pass			Pass				Pass						Pass		
					1	of 51		0	of 51			0	of 51					0	of 51	
					PassU			PassU				PassU						PassU		
					0	of 51		0	of 51			0	of 51					0	of 51	
					N/A			N/A				N/A						N/A		

V2 Element Summary:

Non-Ext Env for EE EC SC LCA



Element Summary: Non-External Envelope	Calculated Total U value	Target Elemental U value	Difference	Pass, Pass/U or Fail	Form Factor target U value	Difference	Pass, Pass/U or Fail	Embodied Energy	Trtaget Embodied Energy	Difference	Pass, Pass/U or Fail	Embodied Carbon	Sequestered carbon	Total Carbon	Target Carbon	Difference	Pass, Pass/U or Fail	Element	Secondary Element
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S2 Basement External Entrance Wall Retaining Pavement (BEEWRP)	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
S3 Basement External Entrance Wall Retaining Wall (BEEWRW)	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
S4 Basement External Entrance Wall Staircase (BEEWS)	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
S5 Basement External Entrance Wall Party wall (BEEWPW)	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
Basement Walls, Partitions and Cubicles	to be developed																		
S8 Basement Internal Walls (BIW)	0.000	0.00	0.00	0.00	0.110	-0.110	Pass	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
Yes S9 Basement Internal Partitions (BIP)	0.263	0.00	0.00	0.00	0.110	0.093	Fail	0.00	0.00	0.000	Fail	0.00	3.00	-3.00	0.00	-3.000	Pass	Y	
Yes S10 Internal Walls (IW)	#VALUE!	0.00	0.00	0.00	0.110	#VALUE!	#VALUE!	0.00	0.00	0.000	Fail	0.00	3.00	-3.00	0.00	-3.000	Pass	Y	
Yes S11 Internal Partitions (IP)	0.263	0.00	0.00	0.00	0.110	0.093	Fail	0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail	Y	
S12 K32 Internal Cubicles (IC) & Back Panels (ICBP) & Internal Wall Linings (IWL)	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
	to be developed																		
S1 Eaves Parapet Walls (EPW)	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
S2 Party Wall Parapet (PWP)	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
S3 Chimneys/Chimney Breast (CICB)	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
S4 Attached Party Fank wall/Side Boundary Wall (APFWSBW)	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
Foundations	to be developed																		
S5 Foundation (F) (Strip or trench)	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
S6 Foundation Wall (FW) (over strip)	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
S7 Sleeper Wall (SW)	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
S8 Raft Foundation Slab & Strips	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
S9 Pad foundation & column	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
T0 Pile foundation & Grounds beams	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
T1 Diaphragm wall	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
T2 Secant Pile Wall	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
Secondary Elements (SE)	to be developed																		
L30 Staircase/Landing/Walkways	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
Furniture Fixtures Equipment (FFE)	to be developed																		
N10 Attic Eaves Furniture (AEF)	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
N10 Other Furniture (OF)	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
N11 Kitchen Furniture (KF)	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
N12 Catering Equipment (CE) (Non-Domestic)	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
N13 Sanitaryware Bathroom Furniture (SBF)	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
P Building Fabric Sundries	to be developed																		
P10 Sundry Insulation/Proofing work	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
P11 Foamed/Fibres/Bead cavity wall insulation	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
P12 Fire Stopping Systems	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
P14 Air/Wind Tightness Systems	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
P20 Unframed Isolated Trims/Skirtings/Sundry Items	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
P21 Ironmongery	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
P22 Sealant Joints	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
P23 Movement Joints (Non-domestic)	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
P30 Trenches/Pipeways/Pits for buried engineering services	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
P31 Holes/Chases/Covers/Supports for Services	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
P32 Services Painting (And identification?)	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
P33 Plinths and Bund Systems	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
P39 Cable Pass Throughs (Non-Domestic)	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
Landscape (L)	to be developed																		
Q10 Raised Beds	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
Q10 Stairs	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
Q10 Steps	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
Q20 Drive	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
Q20 Paths	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
Q20 Ramps	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
Q30 Lawn	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
Q31 Boarders	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
Q40 Fence and Gates	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
Q41 Railings and Gates	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
Q51 Sports Equipment	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
Q53 Bat or Bird Accommodation	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
Q55 Decking	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
Q60 Pond/Water Feature/Swimming Pond	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
Q70 Composter and Wormeries	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
Q70 Front/Rear Garden Bin/Bike/Delivery Store	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
Q70 Pergolas	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
Q70 Rear Garden Shed	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
Q75 Retaining walls	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
Domestic MEP Services (DMEPS)	to be developed																		
J00 Basement Internal Drainage	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
R10 Rainwater Gutters Pipework	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
R11 Above ground drainage	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
R12 Below ground drainage	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
R91 Refuse Disposal System Domestic	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
S17 Rainwater Harvesting	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
S93 Hot and Cold Water Domestic	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
S97 Gas Supply Domestic	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
S92 Sprinkler System Domestic	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
T54 Air Water Ground Source Heat Pumps	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
T16 Solar Collectors	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
T90 Heating Domestic	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
L90 Ventilation Domestic	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
V90 Electrical Installation Domestic	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
V91 Electrical Systems Landscape	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
W90 Communications & Security Domestic	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
X90 Transport Systems Domestic	to be developed							0.00	0.00	0.000	Fail	0.00	0.00	0.00	0.00	0.000	Fail		
	to be developed							0.00	0.00	0.00	63	0.00	0.00	0.00	0.00	0.00	63		

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V1 Awards/Shortlists

- 3 months after V1.0.0. launch
  - Green Apple 2020 Award Winner
    - Category and metal to be announced
  - Central England Prestige 2020-21 Winner
    - November announcement
  - Construction Computing 2020 Awards Shortlisted: (Announcement Nov/Dec 2020)
    - Innovation of the year 2020
    - One to watch Company 2020
- Submitted Applications:
  - CIBSE Building Performance Award 2021
  - PEA Awards 2020

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Feedback

- These files are created by generalists with a big dollop of green flavour
- These files are updated from time to time
- We are not experts so from time to time these file may get out of date or may be wrong.
- If you feel that we have got it wrong please let us know so we can put it right

Revisions

- First written 2006
- Updated to 2020
- GorV added ex 2003
- Added GBC 2020

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- Brian Murphy ONC HNC Construction, BSc Dip Arch (Hons+Dist)
  - Technician and Architect by Training
  - Specification Writer by Choice
  - Environmentalist by Actions
  - Writer and Educator as a Calling
- Greening up my act since 1999
- Founded National Green Specification 2001
- Founded and Funded www.greenspec.co.uk 2003-2013
- Created: GBE at https://GreenBuildingEncyclopaedia.uk 2012 2020
- Created: GBE learning: https://GBELearning.com 2020
- Created: GBC at https://GreenBuildingCalculator.uk 2020
- E BrianSpecMan@icloud.com
- Twitter: https://twitter.com/brianspecman
- Twitter: https://twitter.com/gbeGreenBuild
- Twitter: https://twitter.com/GBELearning
- LinkedIn: BrianSpecMan
- Facebook: BrianSpecMan http://www.facebook.com/brianspecman
- GoogleMyBusiness: National Green Specification
- Pinterest: Brian Murphy GBE Green Building Encyclopaedia
- Pinterest: https://www.pinterest.co.uk/bmurphy1390/
- National Green Specification