

CombiCycle_Comparator **A Brief Overview**

Presentation to

buildoffsite Direction Group

by

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31st October 2018

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- **What is CombiCycle Comparator?**
- **Brief overview of functionality**
- **Why CombiCycle Comparator**
- **2016-2018 developments – Version 6**
- **The eclectic pricing system**
- **The Business Case module**
- **Discussion**
- The major thrust of this presentation is to justify the use of a reliable model for early cost prediction and analysis. This is as much a requirement for offsite construction as it is for traditional methods

The '*Comparator*' extension to



- CombiCycle is an existing web-enabled program
- Predicts whole-life cost, sustainability and construction time.....
-of any building from inception – pre-Stage C
- Applicable from inception to completion
- No separate '*Comparator*' model
- '*Comparator*' research project part-funded by UKCES

The Default Result – Costs

Project: Default - Building: Generic_Minimarket	
GIA: 1000 M ² - Location: South East	
Cost Centre	Default
Viewing Result Totals ▾	
Quality	Average
Cost Analysis Period	30 Years
Capital	£ 2,463,958
Life-cycle replacement	£ 1,017,028
Maintenance	£ 327,526
Cleaning	£ 72,745
Energy (in occupation)	£ 2,492,230
Waste Disposal	
Demolition	
Whole Life Total	£ 6,373,487

- This is the Results screen which is available after the user has entered the information about shape and size of the proposed building; the whole-life costs are shown here.

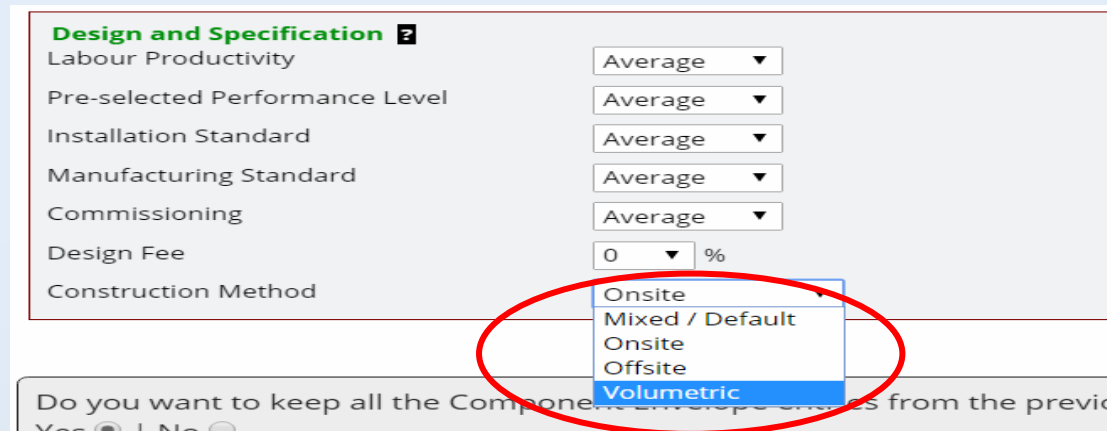
The Default Result – Sustainability

Whole Life Total	£ 6,373,487
Whole life sustainability factors (show/hide)	
Energy (in occupation) MWh	20,944
CO2 (in occupation) Tonnes	12,294.09
CO2 (embodied initial) Tonnes	183.03
CO2 (embodied - replacement) Tonnes	61.17
Total Building Weight - Tonnes	456
Sustainability rating	
Initial sustainability	7.5
Sustainability Rating	A

- The screen can be expanded to show the embodied and in-use energy and CO2 emissions. There is also a Sustainability score based on the Green Guide list of 'nasties' and their weightings

Selecting the Construction Method

- No need to select every item as either modular or volumetric
- E.g. with volumetric :
- Select spec for all items and then instruct model to choose volumetric



Design and Specification ?

Labour Productivity	Average ▼
Pre-selected Performance Level	Average ▼
Installation Standard	Average ▼
Manufacturing Standard	Average ▼
Commissioning	Average ▼
Design Fee	0 ▼ %
Construction Method	Onsite Mixed / Default Onsite Offsite Volumetric

Do you want to keep all the Component Specification choices from the previous study?
Yes ☒ No ☐

- This selection can be made at the commencement of the study. Everything which can be volumetric will become so. Variations to individual items can be made as you go through the detail.

Results Page – Volumetric Programme Implications

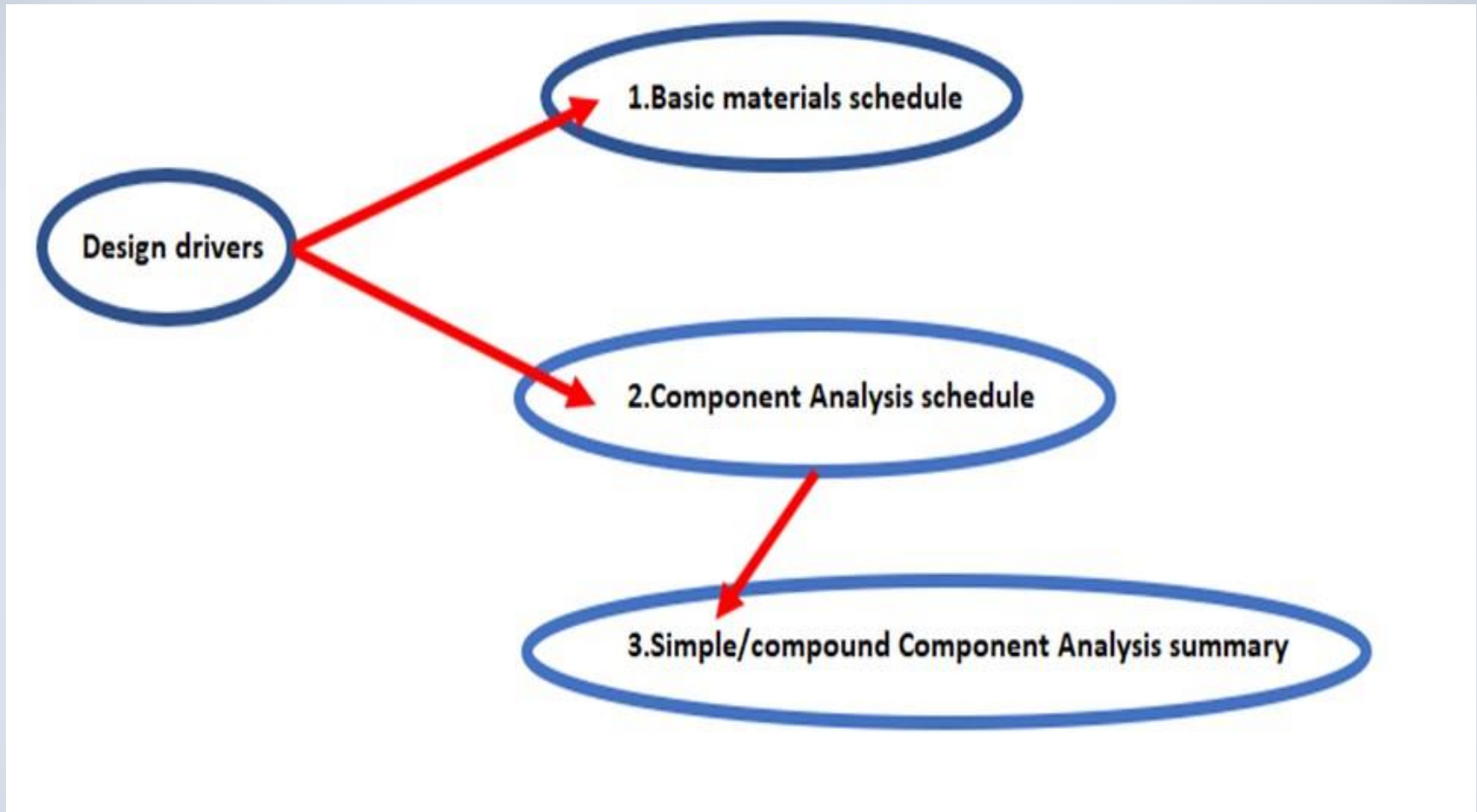
Project: KFCNANT 04.08.2015 AT 09:03:54 - Building: New Build 260			
GIA: 300 M ² - Location: Wales			
Cost Centre	Default	Select Survey Default volumetric_16.12.15	Select Survey Default volumetric_16.12.15
Viewing Result Totals			Filter Element
Quality	Average	Average	Average
Cost Analysis Period	30 Years	30 Years	30 Years
Capital	£ 494,668	* £ 487,558	* £ 487,558
Life-cycle replacement	£ 176,052	£ 177,785	£ 177,785
Maintenance	£ 277,564	£ 279,584	£ 279,584
Cleaning	£ 28,299	£ 29,615	£ 29,615
Energy (in occupation)	£ 569,483	£ 569,509	£ 569,509
Waste Disposal			
Demolition			
Whole Life Total	£ 1,546,066	£ 1,544,051	£ 1,544,051
Whole life sustainability factors (show/hide)			
Sustainability rating			
Initial sustainability	5.7	5.9	5.9
Sustainability Rating	B	B	B
Replacement sustainability			
Time on Site			
Time on Site (weeks)	23.9	9.3	9.3
* Includes saving in Preliminaries		15,374	15,374
**Includes waste materials adjustment - CO2 (embodied Initial) Tonnes		0	0
Breakdown By Cost Centre: Default volumetric_16.12.15		Breakdown By OnSite / Offsite: Default volumetric_16.12.15	

- A volumetric solution is saving significant time on site. The cost-neutral costing built into the model still allows for savings in Preliminaries and Waste. The latter also reduces the embodied carbon content. Offsite suppliers may enter actual cost data.

How CombiCycle works- Specification and design details

1. Quantities are generated by the model based on data entered about probable GIA, number of floors and building shape.
2. User can amend/adjust these as further information becomes available
3. V5 has a static database of conventional spec items.
4. V6 has a dynamic database which it is intended will cover all material specification options
5. The user may bespoke the database to his/her own specifications and level of detail – NRM incorporated in V6

V6 Analysis structure



- Each material has its own Properties database e.g density, carbon and price. These properties are drawn down for use in a component evaluation at which point the specific format of the component and its labours are introduced, The quantities and mixes required are picked out from the Design Drivers envelope.

Why CombiCycle Comparator? Functionality

- **Depth of analysis**
 - **Accuracy**
 - **Correct SCOPE (n.b. External Works!)**
 - **Impartial – part of standard system**
 - **Speed of calculation**
 - **Manipulable data**
 - **Totally transparent**
 - **User – friendly**
-
- Users may enter their own values for prices, carbon emissions etc. However they have to declare these amendments and these declarations appear in the audit trail as departures from the system's data.

Why CombiCycle Comparator?

Content

- Whole-life costs
 - Programme time and manipulation
 - Embodied carbon
 - Sustainability 'Green Guide' linked scoring
 - Energy consumption by contributing factors
 - Onsite v offsite comparison
- What are the options?
 - The model provides all the information needed to make a comprehensive comparison between alternative design and construction solutions. The onsite/offsite comparison is an intrinsic feature of the wider model: Comparator is not a standalone model.

Published Cost Ranges

Local Authority and Housing Association schemes				
Housing Association Developments (Code for Sustainable Homes Level 3)				
Eungalows				
semi-detached	m ²	950.00	to	1175.00
terraced	m ²	900.00	to	1125.00
Two storey housing				
detached	m ²	950.00	to	1175.00
semi-detached	m ²	900.00	to	1125.00
terraced	m ²	790.00	to	1000.00
Three storey housing				
semi-detached	m ²	950.00	to	1175.00
terraced	m ²	790.00	to	1000.00
Apartment blocks				
low rise	m ²	950.00	to	1175.00
medium rise	m ²	1175.00	to	1475.00
Sheltered housing with wardens accommodation	m ²	900.00	to	1125.00

- Cost consultants do not use these published ballparks when providing advice on alternatives. However some people do so at their peril! Apart from the wide range there is no mention of whether these costs include External works

Published Cost Analysis – Outline Specification

3C Ceiling finishes	12.5mm plasterboard and skim.
4 Fittings	Provisional Sum £47,250 for kitchen appliances and fittings.
5A Sanitary appliances	Baths, wash basins, WCs, showers, shower enclosures.
5B Services equipment	Kitchen equipment.
5C Disposal installations	Soil and waste pipes.
5F Space heating and air treatment	Provisional sum £93,600 for mechanical and electrical services. Gas HW central heating.
5G Ventilating systems	Ventilation.
6H Electrical installations	Electrics.
5N Builder's work in connection	Builder's work in connection with pipe settings.
6A Site works	Site clearance. Macadam and gravel pavings. Artificial river walls, timber close boarded and post and rail fencing. Landscaping.
6B Drainage	Foul and surface water drains, pumping station, adoptable works, Hydrobrake and 24,800litre GRP storage tank.
6C External services	Provisional sum £25,000 for incoming electricity, gas, water and telephone services. Site lighting.
6D Minor building works	1No double and 8No single garages with piled foundations and pitched roofs. 9No refuse stores.
7 Preliminaries	20.79% of remainder of Contract Sum (excluding Contingencies).
8 Contingencies	2.10% of remainder of Contract sum (excluding Preliminaries).

- These analyses are provided by professional qs's. But they often don't get involved with the cost control of the building services – hence this rather vague specification!

Whereas.....

- CombiCycle gives you a complete priced Schedule of Quantities at **Feasibility Stage!**

Priced Schedule of Quantities

	Pricing Parameter	Quantity	Rate £	Total £
View Primary View All				
Substructure				
Foundations - EDIT				
Plain foundations				
Excavation				
Trenches plain strip - Machine excavation	m3	151	8.40	1,270
Spoil disposal				
Foundation spoil onsite - Inactive spoil	m3	50	2.63	132
Excavation obstructions				
Break out obstructions - Brickwork or blockwork	m3	18	31.50	556
Wall foundations				
Strips - Plain concrete	m3	7	105.01	688
Damp-proofing				
Damp proof courses - Polyethylene dpc	m2	28	10.50	298
Cavity wall				
Outer skin - Common clay brick	m2	224	52.51	11,743
Inner skin - Blockwork mineral aggregate	m2	224	27.30	6,106
Form cavity with ties - Galvanised mild steel	m2	224	2.10	470
Fill cavity concrete - Weak concrete	m3	11	147.01	1,644
Ground floor - EDIT				
Site preparation				
Excavation				
Oversite topsoil - Machine excavation	m3	38	10.50	397
Oversite reduce levels - Machine excavation	m3	126	1.89	238
Ground treatment				

- The quantities are pre-calculated within the model and the rates are built up from first principles i.e. materials, labour, plant, transport, waste, OHP. Users are presented with this analysis – they don't have to create it. But they can interrogate the basis and amend to reflect their own knowledge.

Price Book Detail – Timber Roof Trusses

75mm thick cement and sand screed	m ²			
75mm thick lightweight bituminous screed and vapour barrier	m ²			
Softwood trussed pitched roofs; Structure only				
Timber; roof plan area (unless otherwise described)				
comprising 75 mm × 50 mm Fink roof trusses at 600 mm centres (measured on plan)	m ²	29.00	to	35.00
comprising 100 mm × 38 mm Fink roof trusses at 600 mm centres (measured on plan)	m ²	32.50	to	39.50
Mansard type roof comprising 100 mm × 50 mm roof trusses at 600 mm centres; 70° pitch	m ²	33.50	to	40.50
forming dormers	m ²	560.00	to	680.00
trusses with tile coverings				
roof plan area (unless otherwise described)				
trusses; insulation; roof coverings; PVC rainwater goods; insulation to ceilings (U-value = 0.25 W/m ² K)				

- More detailed information for approximate estimating is available in the published price books. In this example two of innumerable options are given leaving the user to interpret the actual specification and cost required to meet the design drivers.

Choosing the Roof Structure in CombiCycle Comparator



- Following the Roof Trusses example for a moment this is how **CombiCycle** approaches the prediction of such costs. Here the model has allowed us to qualify the search by selecting the type of pitch and a gable-end design.

Selecting a Trussed Frame

Function Format Selection

Check for material selection errors

Page Helptext

Return

Calculate result

Roof : Enclosing dual pitch gable ended roof : Structure : Structural framework

The total for all items in this area must accumulate to 100%

6429 Cut raftered frame

☐ Yes ☒ No

0 %

0 m²

(V6) Sections - Wood fr ▼

6431 Trussed frame



☒ Yes ☐ No

100 %

378 m²

Edit

OnSite ▼

(V6) Sections - Wood_fr ▼

Please select type

(V6) Sections - Steel

(V6) Sections - Wood_framed

Edit Primary Quantity

Show Updated Quantity

Edit Properties

Add Alternative Components

- The complete range of options will be open to the user in Version 6. Currently there are two options built in and Wood-framed trusses have been selected. This option can be overturned by the users and in the process they can see all the cost and environmental implications of their decisions.

Design/Cost Drivers – Pitched Roof Structure

DESIGN DRIVERS

Please answer the questions below for your design driver requirements.
If you do not see any questions, the information has then been taken from other items.

Roof Type	Gable ended ▼
Roof Shape	Rectangular ▼
Pitch Degrees	35
Average width	7 m
Average length	6 m
Type of span % total area	100 m
% Regular span area on plan	100 %
Clear Span	6 m
Centres	400 no.
Dead load	1 kN/m ²
Superimposed load	2 kN/m ²
Superimposed load loft	0.5 kN/m ²
Snow load	0 kN/m ²
Wind load	0 kN/m ²

- When investigating the Default Survey assumptions users can review the design drivers upon which the specification, quantities and costs have been predicated. They can then modify them to suit their own project's specific requirements – the model will change the costs and environmental values.

Capital Cost Summary – Trussed Roof Structure

Component	£/m2 roof area
Truss	27.48
Braces	4.81
Wall_plates	2.04
Total	34.33
Plus indexation	

- The model has analysed the cost and environmental impact of the selected trusses and design drivers. The price is per m2 of the roof area which is the way such components would normally be costed at approximate estimating stage. Compare this price with the Price Book rate shown above - £29-35 per m2 of roof area..
- Note that the truss itself is the subject of a separate detailed analysis calculating the timber and metal components separately.

Why this detail?

- Onsite v offsite split of labour
e.g. trusses v wall plates
- Embodied carbon content of materials
e.g wood plates and steel connectors
- Programme time and sequence
 - e.g. wall plates v trusses
- The traditional approximate leaves off where **CombiCycle Comparator** starts. The user is presented with this level of detail immediately the model is opened up.

Team Member Contributions from Inception

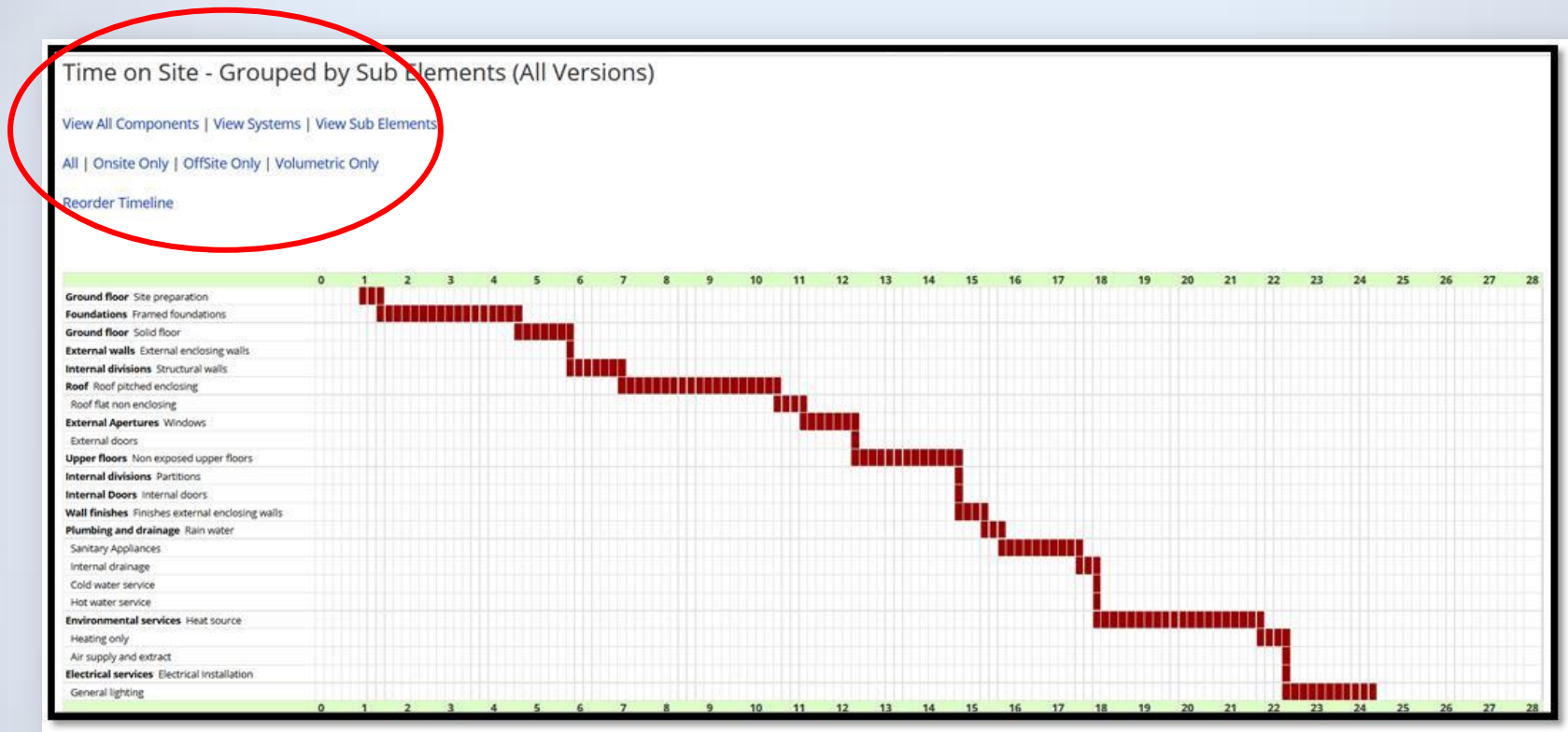


- The importance of involving all the skills at the outset when key decisions are being taken cannot be overemphasized. E.g. the Facilities Manager can be party to decisions taken which will affect his budget/commitments.

Analysis and modelling of project time and resources

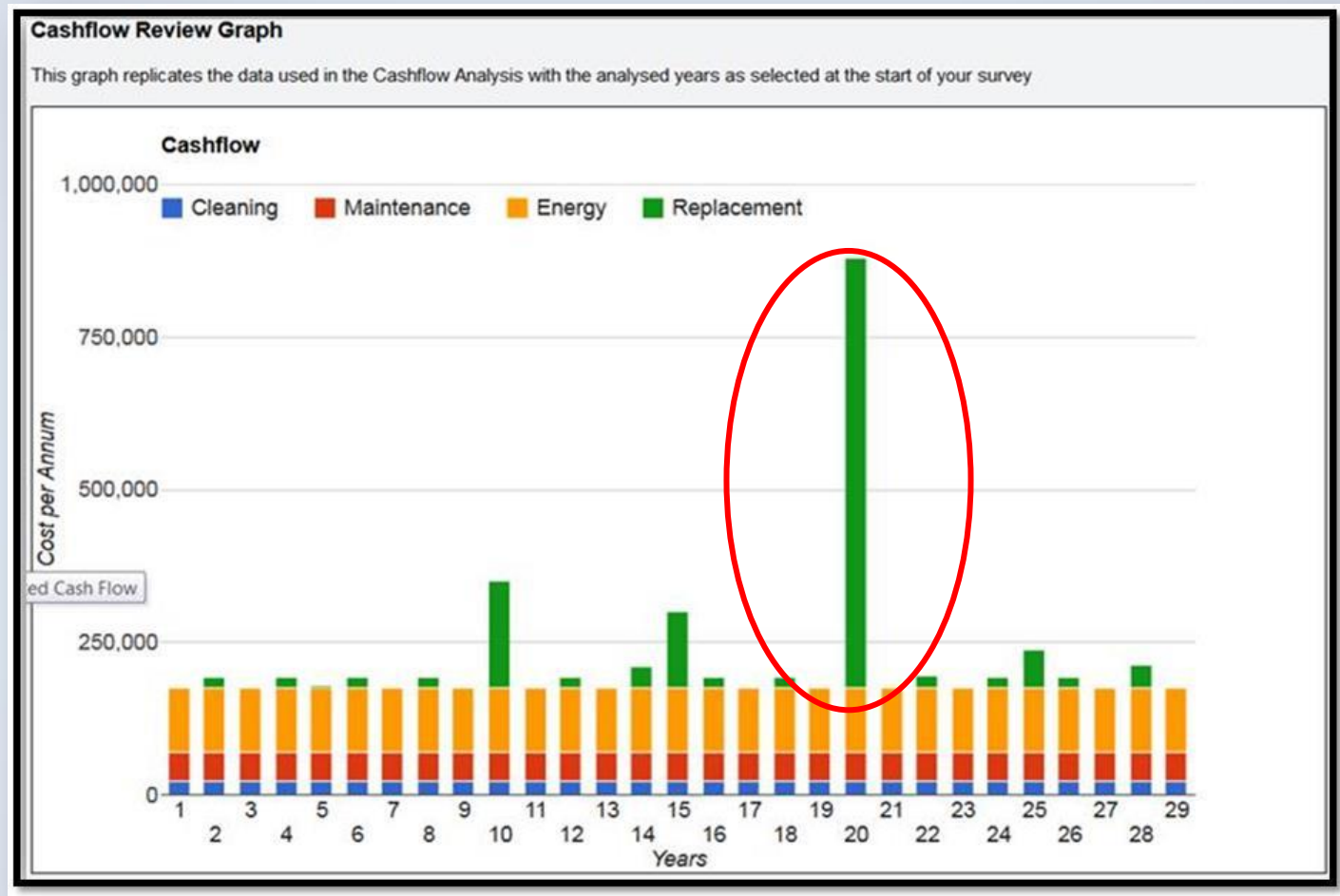
- Works and preliminaries cash flow modelled for time.
- **Offsite options** compared with traditional for:
 - Construction costs
 - Preliminaries costs
 - Project time
 - Project lead-in period (V6)
- Adjustments made for
 - Site productivity (V6)
 - Acceleration (V6)
 - Deceleration (V6)

Construction Programme – More Detailed



- The model produces a Gantt chart for each solution. It can display the result at any level from Module to individual component

Whole-life Cashflow Graph



- The whole-life implications of each solution can be displayed graphically. Here the predicted replacement of a major component in Year 20 can be discussed in the context of other options with different capital, lifetime and environmental impacts.

Project cashflow

Cash Flow Analysis - Grouped by Elements (All Versions)

[View All Components](#) | [View Systems](#) | [View Sub Elements](#) | [View Elements](#)

[All](#) | [Onsite Only](#) | [OffSite Only](#) | [Volumetric Only](#)

	0	1	2	3	4	5	6	7	8	9	10	11
Foundations		£ 49,783.39	£ 49,783.39	£ 49,783.39								
Roof					£ 15,814.60	£ 15,814.60	£ 15,814.60	£ 15,814.60				
Ground floor												
External Apertures									£ 20,191.86			
External walls										£ 13,045.25	£ 13,045.25	£ 13,045.25
Upper floors												
Internal divisions												
Internal Doors												
Wall finishes												
Plumbing and drainage												
Environmental services												
Electrical services												
Weekly Cost	£ 0	£ 49,783	£ 49,783	£ 49,783	£ 15,815	£ 15,815	£ 15,815	£ 15,815	£ 20,192	£ 13,045	£ 13,045	£ 13,045
Monthly Cost					£ 165,165				£ 67,636			

- The project cash flow can be displayed in modular format or in elements (as shown here). Finance rates can be applied to these periodic costs and the regular interest payments used in the Business Case calculator (see below)

V6 Sustainability

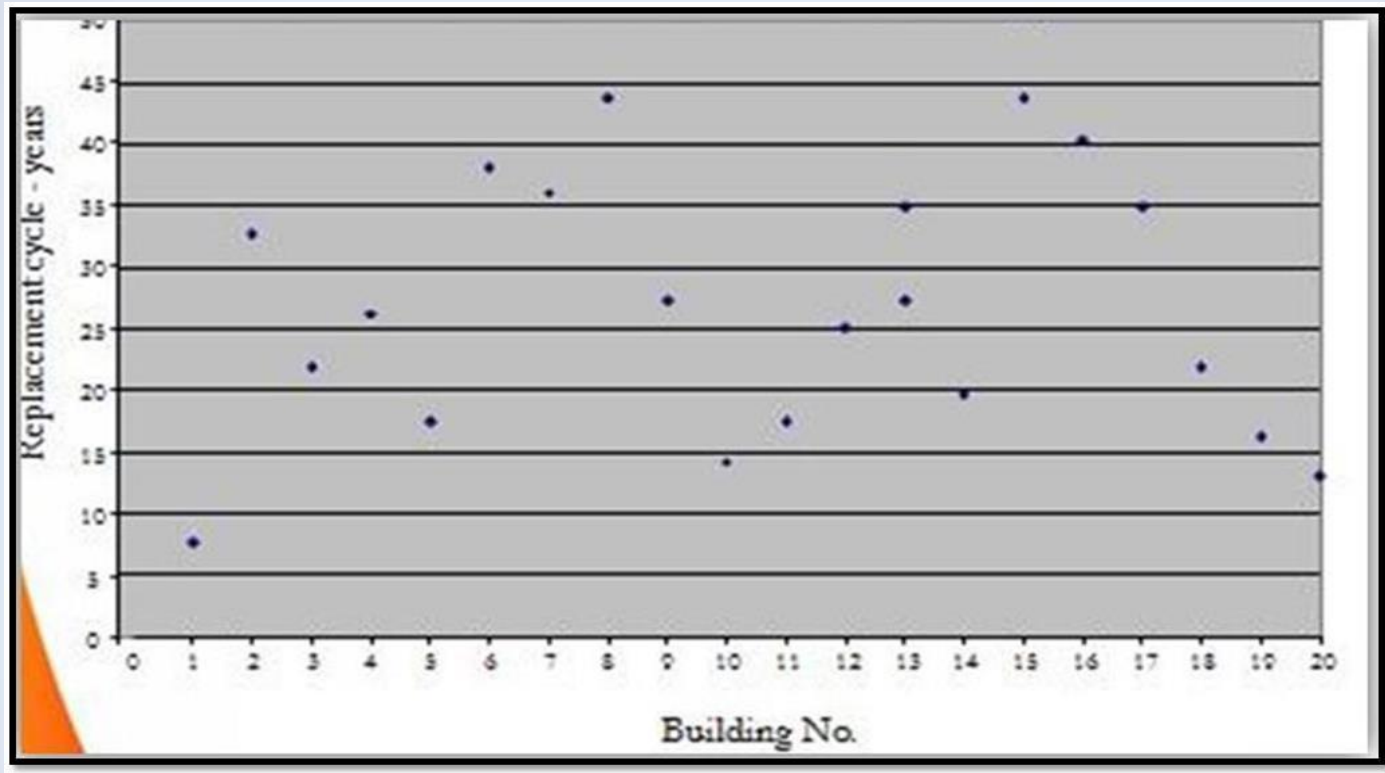
- V6 Adjusts the embodied carbon total and Sustainability score for :
-the difference between the **average** recycled/reclaimed content of the material and the bespoke or specified content
- E.g. the CO₂e Emissions for a material with a recycled content of 50% against an average of 30% are calculated as less and ...
- ...the Sustainability score is higher proportionately.
- Data on embodied carbon content of materials is very sparse and mostly limited to typical values for a generic material type. Comparator enables users to interpolate Co₂e values for components with a specific recycled or reclaimed content which differs from the norm

Reinforced Concrete – Embodied Carbon Analysis from CombiCycle Excel

Component	kgCo2e/kg	Material weight kg/m3	kgCO2e/m3 concrete
Concrete	0.080	2329.108	185
Reinforcement	1.40	130.00	182
Formwork	0.4600	9.19	4.23
	1.939618	2468	372

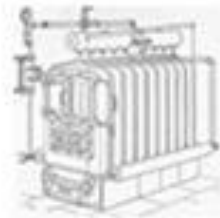
- Although this value is typical for reinforced concrete it will vary extensively according to the type and quantity of cement and reinforcement used. CombiCycle Comparator can predict accurately for any mix or grade....
- ...or number of uses!

Life-cycle Risk Analysis



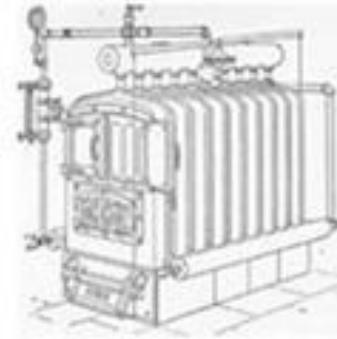
- This is the result of a live case study looking at the failure times of a specific product. It proves that 'average' life cycles are not suitable for use in detailed comparative evaluation. Comparator tracks the critical failure drivers and builds them into the appraisal

Building Services Cost Curves



Boiler A

£1 per sq.m GIA pa

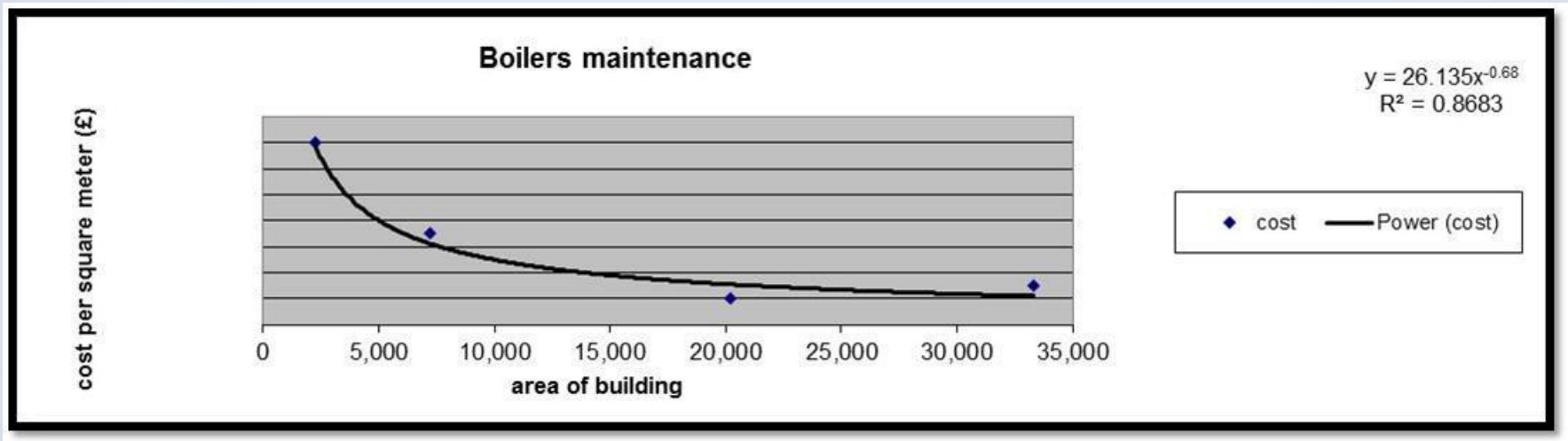


Boiler B

£0.2 per sq.m GIA pa

- CombiCycle was built originally as a Building Services cost model. All the services costs and values are built on cost curves according to the size of the building under analysis. There are curves for capital and running costs ; however the energy costs are further modified by the fabric specification, controls and consumption drivers.

Building services cost curves



- This shows how the maintenance cost of the boilers varies according to the size of the building. All the services have their own calculated cost curves.

Viewing The Services Results - Detail

Element	Capital	LCR	Maint	Clean	Energy	E
Viewing Totals Only						
	£ Total	£ Total	£ Total	£ Total	£ Total	T
Complete Building Total	5,365,782	1,372,063	1,130,110	653,226	2,548,307	
<< Back to Primary Selection						
Services						
Environmental services - EDIT						
Air supply and extract						
Kitchen supply and extract						
Air handling unit - Combined ducted	8,891	8,890	12,871	0	15,210	
Flex ductwork - PVC wire	412	0	0	0	0	
Supply grilles - Plastic	412	0	0	0	0	
Cooker hood - Stainless steel	4,967	5,463	25,485	0	0	
Louvers - Coloured aluminium	1,846	0	0	0	0	
Dampers - Opposed blade	2,144	2,358	0	0	0	
Ductwork - Galvanised steel	5,005	0	0	0	0	
Attenuators - Insulated box section	1,395	0	0	0	0	
Extract fans - Individual ducted	2,059	2,265	6,324	0	8,571	
Toilet extract						
Individual stand alone	8,620	9,482	6,548	0	74,826	
Inlet grilles - Coloured aluminium	3,139	0	0	0	0	
Louvers - Coloured aluminium	2,120	0	0	0	0	

- The initial Default Survey has the services costs at this level of detail ; most qs's don't have this level of detail at the end of the project.

Energy consumption – U-values

Project: **Residential** - Building: **Terraced Town House** - Survey: **Survey_28_12.09.15**

Heating Category Adjustment Cooling Category Adjustment

General Electricity Cooling Energy Consumption Heating Energy Consumption Lighting Energy Consumption U-Values

U-Values

Conductance Element	U-value	
Lowest Floor - on ground	0.140	
Lowest Floor - exposed	0.000	
Upper Floors - exposed	0.000	
Enclosing roof	0.081	
Rooflights	0.000	
External Walls - exposed	0.435	*
Ext.Walls - adj. to ground	0.000	
External Apertures	2.085	*

* The calculated U-Values for this item is above the Maximum acceptable U-values under the UK Building Regulations Part L1A 2013 and ideal values for achieving Target Fabric Energy Efficiency (TSEE)

- The U values of the enclosing fabric are calculated by the model from the specification and thicknesses of the materials selected. If the U values do not comply with current legislation the model will flag this up.

Predicting Energy Consumption – by Contributing Functions

Survey Results

Element Analysis

Save to Excel / Fullscreen

Survey Management

Select All | Select None

☒ Capital

☒ LCR

☒ Maint

☒ Cleaning

☒ Energy £

☒ Energy CO2

☒ Energy MWh

☒ Eny.emb (inl) MWh

☒ Eny.emb (inl) CO2

☒ Eny.emb (lcr) MWh

☒ Eny.emb (lcr) CO2

☒ Score

☒ Quantity

☒ Weight

Element	Energy	Capital	LCR	Maint	Clean	Energy CO2	Energy MWh	Eny.emb (inl) MWh	Eny.emb (inl) CO2	Eny.emb (lcr) MWh	Eny.emb (lcr) CO2
Viewing Totals Only											
Complete Building Total	2,548,307	5,365,782	1,372,063	1,130,110	653,226	23,312	40,801	6,257	2,237		
<< Back to Primary Selection											
Services											
Environmental services - EDI											
Heat source	91,479	87,719	31,209	12,040	0	1,317.28	3,332.06	19.13	4.56		
Fuel Installation	0	15,343	0	0	0	0.00	0.00	0.00	0.00		
Cooling source	613,409	117,978	33,958	20,032	0	5,491.45	9,355.11	101.55	24.11		
Heating only	0	749	823	165	0	0.00	0.00	0.00	0.00		
Space Conditioning	371,500	201,967	151,911	147,510	0	3,325.79	5,665.74	320.41	67.59	10	
Air supply and extract	98,606	68,381	30,339	75,525	0	882.76	1,503.85	125.36	28.67	3	
Total	1,174,994	492,137	248,240	255,273	0.00	11,017	19,857	566	125		
	View chart	View chart	View chart	View chart	View chart	View chart	View chart	View chart	View chart	View chart	View chart

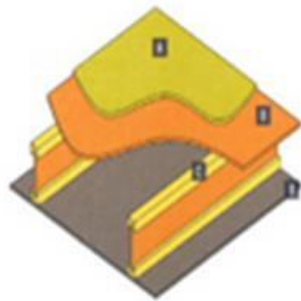
- The model shows where the energy is likely to be consumed by the environmental services and the whole-life cost and environmental implications of each contributing feature.

Energy –in-use

- The model takes into account ALL the significant factors normally used in predicting energy consumption and control thereof, e.g.
- Material k values and thickness
- Degree days
- Time in use – building and plant
- Controls
- Air leakage
- Heat gains
- Etc. etc.

Links to BIM libraries/web-sites

Searching items for: Internal in Non_exposed_upper_floors



- 20mm chipboard
- 20mm OSB decking
- 220mm – 250mm deep solid timber or engineered timber joist
- 20mm glass plasterboard

Note: OSB decking is not required when using pre-finished chipboard (sawn) surfaces.
Note: Metal web joist can also be supplied, if desired.

Timber floor cassette

Add Assembly to Survey

- Comparator is built to work with both BIM libraries and manufacturers' website data – provided they are populated with the data required to be imported directly into the program.

Eclectic Evaluation System (Version 6)- Objectives

- **Avoid use of schedules of rates**
- **Integrate with data on suppliers' websites and BIM libraries**
- **Calculate prices/properties of 'all-in' rates used in approximate estimates (e.g. reinforced concrete floor slab) from first principles**
- **Obtain 'ballpark' values for new or unusual components**
- The program will not work as a universally applicable product if users have to continually approach the proprietors with requests to incorporate data on materials/ products not yet in the system. So a method has been developed to allow provisional estimates of these components to be made by the user pending gathering of further detail.

Eclectic evaluation system - example using V6 Format

Function Format Selection

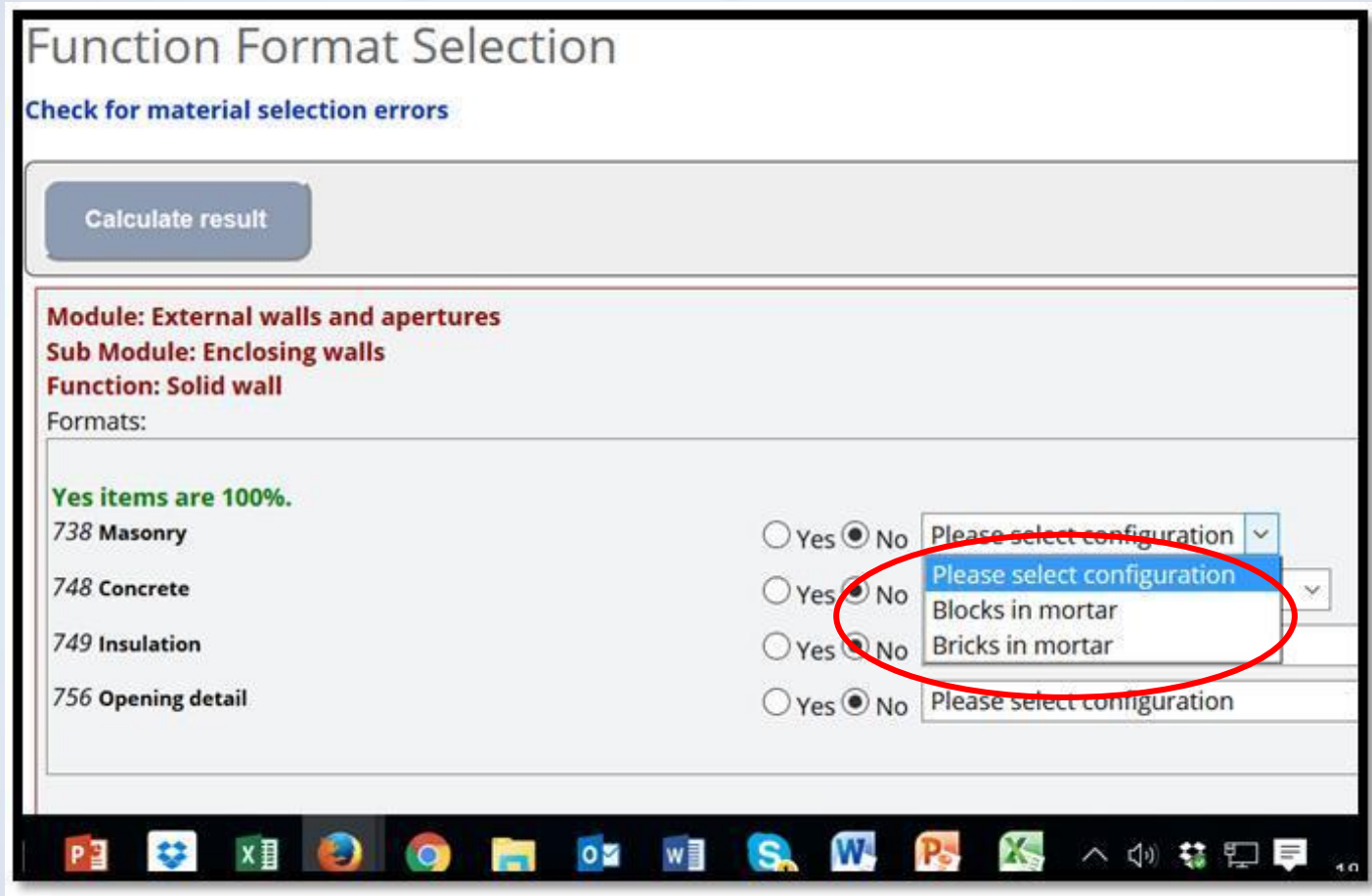
[Check for material selection errors](#)

Calculate result

Module: External walls and apertures
Sub Module: Enclosing walls
Function: Solid wall
Formats:

Yes items are 100%.

738 Masonry	<input type="radio"/> Yes <input checked="" type="radio"/> No	Please select configuration
748 Concrete	<input type="radio"/> Yes <input checked="" type="radio"/> No	Please select configuration
749 Insulation	<input type="radio"/> Yes <input checked="" type="radio"/> No	Blocks in mortar
756 Opening detail	<input type="radio"/> Yes <input checked="" type="radio"/> No	Bricks in mortar



- Version 6 allows the selection of any type of material to fit a module requirement. Here the choice of bricks or blocks is a preliminary filter.

Eclectic evaluation system - example using V6 Format

Bricks in mortar

Materials & Options

Bricks - Compound Component: **Bricks**

Remove this Material

Percentage: **100** %

Bricks

Clay

Please Select - Subgroup

Clay

Sand_lime

Concrete

Flint_lime

Flyash

Unfired_clay

Glazed

Firebrick

Glazed_brick

ilable

- The types of brick (and other materials) available in the system are intended to be all-embracing. Within each category all the know varieties are accessible from the model.

Eclectic Evaluation System - Example Using V6 Format

NAVIGATION

- Materials Schedule
- Material Dimensions
- Capital Cost & Performance
- Unit Quantity Calculation
- Component Life Cycle
- Maintenance Assessment
- Environmental Sustainability
- Prime Cost Analysis
- Programme Time
- Properties / Notes

Bricks in mortar

Materials & Options

Bricks - Compound Component: **Bricks**

Remove this Material

Percentage: **100** %

Bricks

Clay

Common

Machine_moulded

Standard_solid

No further selections are available

Materials & Options

Water - Compound Component: **Mortar**

- The user has filtered out clay bricks. The further options within clay bricks are filtered here. Further options include the size of the bricks, strengths, surface finish etc.

Eclectic Evaluation System - Example Using V6 Format

Materials & Options

Cement - Compound Component: **Mortar**

Remove this Material

Percentage: **100** %

Cement

Please Select - Subgroup

Please Select - Subgroup

Ordinary_grey

Masonry

Rapid_hardening

Quick_setting

Low_heat

Sulphates_resisting

High_alumina

White

Coloured

Air_entraining

Hydrographic

GGBS

Fly_Ash

changes & Refresh page

Close Window

- Similarly you can select from an almost exhaustive list of cements to create the mortar – and the same goes for all the conventional building materials.

The Business Case module



Business Case - Accelerated Project Completion

Cost differential

Default construction cost

£2,000,000

Accelerated construction cost

£2,200,000

Cost of acceleration **£200,000**

Consequences of acceleration

Time saved by acceleration - months

3

Additional net income generated during the time saved

£400,000

Interest on construction costs - saving over reduced period

£15,000

Inflation on construction costs - saving over reduced period

£1,500

Gross benefit/deficit **£416,500**

Net Benefit or Cost £216,500

Conclusion

- We have barely scratched the surface of this extremely comprehensive program.
- Many thanks for your interest
- Any questions?

Design Team Consideration

- Team meets under project manager
- CombiCycle Comparator Default Survey on the table
- Review design and specification solutions
- For each (? Major) component consider:
 - Capex
 - Energy
 - Cleaning
 - Maintenance
 - Life-cycle replacement
 - Sustainability
 - Effect on contract period
 - and In V6/7
 - Combustibility!!!!!!!!
- *At feasibility stage...*
- ...before it's too late

Re-ordering Programme Timeline – More Detailed

Edit Programme Time

REORDER TIMELINE

Site_preparation S ▾	Framed_foundations S ▾	Solid_floor S ▾	Water_supplies S ▾	Structural_Frame C ▾	Roof_flat_enclosing C ▾
External_enclosing_walls S ▾	Structural_walls C ▾	External_doors C ▾	Partitions S ▾	Finishes_structural_walls C ▾	Finishes_internal_columns
Finishes_internal_beams C ▾	Finishes_external_enclosing_columns C ▾	Finishes_external_enclosing_beams C ▾	Lowest_solid_floor_surfaces S ▾		
Rain_water S ▾	Internal_drainage S ▾	Cold_water_service C ▾	Hot_water_service C ▾	Heat_source C ▾	Fuel_Installation C ▾
Cooling_source C ▾	Heating_only C ▾	Space_Conditioning C ▾	Air_supply_and_extract C ▾	Electrical_supply C ▾	Electrical_Installation C ▾
Sanitary_Appliances S ▾	Internal_doors S ▾	General_lighting S ▾	Emergency_lighting C ▾	Ceiling_next_enclosing_flat_roof C ▾	
Fire_protection C ▾	Security C ▾	Control_systems C ▾			

- The user can vary the sequence of construction to explore the effects on the overall timeline.

CO2e analysis of reinforced concrete in CombiCycle

CombiCycle analysis is dynamic and infinitely variable; it can assess:

- Any grade of constituent material
 - Any mix of concrete materials
 - Any type and quantity of additive
 - Any type, shape and size of reinforcement
 - Any type and number of uses of formwork
 - Any source and volume of water and
 - Adjusts for any proportion of recycling/reclamation
- The same is true for any material either simple or compound.

Green Guide Assembly with cost analysis from Comparator

Green Guide Specification	Details
GG Ref	820100046
GG Page	40
Specification	6.1 GROUND FLOORS
	Solid concrete ground floors - Domestic
Comparator Equivalent	Details
	Substructure/Ground_floor/Site_preparation / Ground_treatment /Radon_proof_membrane / Radon_proof_membrane_plastic
	Substructure/Ground_floor/Site_preparation / Ground_treatment / Oversite_levelling_layer / Stone_granules
	Substructure/Ground_floor/Floor_structure / Solid_floor_structure / Bed / Plain_concrete
	Substructure/Ground_floor/Floor_structure / Thermal_insulation / Insulating_layer / Glassfibre
Comparator Data	Whole-life Costs
	£/m2 CUQ
Capital	139.45
LCR	6.93
Maintenance	0
Cleaning	0
Green Guide Data	Rating
GG Summary Rating	D
Climate change	A

- The co-authors of the Green Guide to Specification were on the steering Group for *buildoffsite's* Comparator research project funded by UKCES. Here the whole-life cost of a typical assembly from the Guide is predicted by the model. Comparator can also predict a Green Guide rating for any assembly of materials even if not formally accredited by the BRE.