BUILDING LIFE CYCLE ASSESSMENT – CONCEPT DESIGN STAGE

UNITS 18-20 PLOT B, WINDRUSH

CANMOOR

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INTRODUCTION

Engineering Services Consultancy Ltd (ESC) has been appointed to carry out a building life cycle assessment (LCA) for Units 18-20 Plot B, Windrush. The main purpose of the building LCA is to achieve the BREEAM UK NC V6.1 Mat 01 credits at the concept design stage.

This report has been compiled at the concept stage (RIBA Stage 2), prior to the submission of the planning application.

The building LCA is to be reviewed and updated at technical design stage (RIBA Stage 4).

This report outlines the baseline building LCA for the:

- Superstructure
- Substructure
- Hard landscaping

An options appraisal has also been carried out for the:

- Superstructure
- Substructure
- Hard landscaping

This report makes recommendations following the concept design stage options appraisal which should be evaluated by the design team and incorporated into the design where feasible.

The options appraisal is to be reviewed and updated at technical design stage (RIBA Stage 4).

One Click LCA has been used as the recognised tool to demonstrate compliance.

The building LCA has been produced by Nick Gorrie who has received training on the building LCA tool; has undertaken multiple different LCAs for paying customers in the last two years and is able to interpret construction documentation.

BREEAM NC V6.1 MAT 01 REQUIREMENTS

RIBA STAGE 2 CONCEPT DESIGN

Seven credits and three exemplary credits are available in this issue. Some credits require preceding criteria to be fulfilled first.

In order to have the opportunity to achieve all credits, a recognised LCA tool must be used.

UP TO FOUR CREDITS – SUPERSTRUCTURE

1) During the concept stage, demonstrate the environmental performance of the building as follows:
    a. Carry out a building LCA on the superstructure of the building using an IMPACT compliant LCA tool.
    b. Submit the Mat 01 results to the BRE at the end of the concept design stage (RIBA Stage 2) and before planning permission is applied for.

OPTIONS APPRAISAL DURING CONCEPT DESIGN

2) Item 1) must be achieved. During the concept design stage (RIBA Stage 2) identify opportunities for reducing environmental impacts as follows:
    a. Carry out building LCA options of 2-4 significantly different superstructure design options using a recognised LCA tool. Each design option must fulfil the same functional requirements as the proposed superstructure.
    b. Integrate the LCA options appraisal assessment within the wider design decision-making process and record this in an options appraisal summary document.
    c. Record the differences between the design options, the option selected by the client and the reasons for selecting it and the reasons for not-selecting other options. Submit the Mat 01 results to the BRE at the end of the concept design stage (RIBA Stage 2) and before planning permission is applied for.

ONE CREDIT – SUBSTRUCTURE & HARD LANDSCAPING

3) Items 1) and 2) must be achieved. During the concept design stage (RIBA Stage 2) identify opportunities for reducing environmental impacts as follows:
    a. Carry out building LCA options of at least 6 significantly different substructure or hard landscaping design options using a recognised LCA tool. Each design option must fulfil the same functional requirements as the proposed superstructure.
    b. Integrate the LCA options appraisal assessment within the wider design decision-making process and record this in an options appraisal summary document.
    c. Record the differences between the design options, the option selected by the client and the reasons for selecting it and the reasons for not-selecting other options. Submit the Mat 01 results to the BRE at the end of the concept design stage (RIBA Stage 2) and before planning permission is applied for.

RIBA STAGE 4 TECHNICAL DESIGN

UP TO AN ADDITIONAL TWO CREDITS - SUPERSTRUCTURE

4) During the technical design stage, demonstrate the environmental performance of the building as follows:
    a. Carry out a building LCA on the superstructure of the building using an IMPACT compliant LCA tool.
    b. Submit the Mat 01 results to the BRE at the end of the technical design stage (RIBA Stage 4).

OPTIONS APPRAISAL DURING TECHNICAL DESIGN

5) During the technical design stage (RIBA Stage 4) identify opportunities for reducing environmental impacts as follows:
    a. Carry out building LCA options of 2-3 significantly different superstructure design options using a recognised LCA tool. Each design option must fulfil the same functional requirements as the proposed superstructure.
    b. Integrate the LCA options appraisal assessment within the wider design decision-making process and update the options appraisal summary document.
    c. Record the differences between the design options, the option selected by the client and the reasons for selecting it and the reasons for not-selecting other options. Submit the Mat 01 results to the BRE at the end of the technical design stage (RIBA Stage 4) and before planning permission is applied for.

EXEMPLARY CRITERIA

EXEMPLARY CRITERIA – ONE CREDIT – CORE BUILDING SERVICES

6) Items 1) and 4) must be achieved. During the concept design stage (RIBA Stage 2) identify opportunities for reducing environmental impacts as follows:
    a. Carry out building LCA options of at least 3 significantly different core building services design options using a recognised LCA tool. Each design option must fulfil the same functional requirements as the proposed superstructure.
    b. Integrate the LCA options appraisal assessment within the wider design decision-making process and record this in an options appraisal summary document.
    c. Record the differences between the design options, the option selected by the client and the reasons for selecting it and the reasons for not-selecting other options. Submit the Mat 01 results to the BRE at the end of the concept design stage (RIBA Stage 2) and before planning permission is applied for.

EXEMPLARY CRITERIA – ONE CREDIT – THIRD PARTY VERIFICATION

7) Items 1) to 3) must be achieved. A suitably qualified third party verifies the building LCA work and produces a report describing how they have checked that the building LCA work accurately represents the design under consideration during the concept stage (RIBA Stage 2) and the technical design stage (RIBA Stage 4).

LCA TOOL

One Click LCA is the tool being used to undertake the LCA to demonstrate compliance with the Mat 01 credits. The BRE has awarded One Click LCA with 100% quality score.

One Click LCA has also been verified by the BRE as IMPACT compliant.

The LCA has been carried out by Elspeth Wightman and reviewed by Nick Gorrie, who has successfully completed One Click LCA's training on how to achieve building LCA and EPD credits for BREEAM UK NC V6.

Nick Gorrie has received training on the building LCA tool; has undertaken multiple different LCAs for paying customers in the last two years and is able to interpret construction documentation.

The following documents have been used to build the LCA model in the OneClick LCA software:

- Various drawings from Hale Architecture
  - 23052 - PL-1003_00 - Proposed Site Plan-A1
  - 23052 - PL-1004_00 - Proposed Hard and Soft Landscape-A1
  - 23052 - PL-1100_00 - Units 18 to 20 Proposed Ground Floor GA Plan-A1
  - 23052 - PL-1101_00 - Units 18 to 20 Proposed First Floor Office GA Plan-A1
- Canmoor Developments Limited Cost Plan *240119 Budget Cost Estimate Nr 2 - Plot B, Windrush Estate, Witney*
- Units 18-20 UKNC2018_Mat0102_ResultsSubmissionTool_V2.2
- BREEAM_UK_NC_2018_and_V6_Wat01_Calculator_v2.3

COMPARISON WITH THE BREEAM LCA BENCHMARK DURING CONCEPT DESIGN

SUBSTRUCTURE BASELINE – IMPACT COMPLIANT LCA TOOL

MAT01_CD_SUPERS_B

The One Click LCA for *BREEAM UK IMPACT*-compliant tool has been used to compare the building against the benchmark.

The superstructure base-build has been modelled within the software. The building material inputs for the superstructure using the IMPACT compliant tool can be seen in Appendix A.

RESULTS

The Mat 01 Results Submission Tool confirms that the building achieves **0.7 credits** for the superstructure comparison with the BREEAM benchmark.

Superstructure - Comparison with the BREEAM benchmark

A completed 'Mat01_CD_SuperS_B' data file shall be saved in the same folder as this file.

Design option		Option data file link	m2 net internal area	BRE EN ecopoints/m2 net internal area (60 year study period)							
ID	Name			2.1 Frame	2.2 Upper floors	2.3 Roof	2.4 Stairs and ramps	2.5 External walls	2.6 Windows and external doors	2.7 Internal walls and partitions	Total
B1	Mat01_CD_SuperS_B	Link	5072	1.47	0.20	0.25	0.01	0.18	0.00	Not in scope	2.12

Result from tool (BRE EN ecopoints / m2 NIA):	2.12
Benchmark value for this building type (BRE EN ecopoints / m2 NIA):	2.18
Percentage better than benchmark:	2.7%
Credits awarded:	**0.70**

SUPERSTRUCTURE OPTION APPRAISAL DURING CONCEPT DESIGN

SUPERSTRUCTURE BASELINE – ONECLICK LCA TOOL

MAT01_CD_SUPERS_OPT1

In order to complete the *Mat 01 Results Submission Tool* Option 1 is equivalent to the Base-build design, however this has been remodelled using the OneClick LCA database.

The superstructure base-build has been modelled within the software. The building material inputs for the superstructure using OneClick LCA can be seen in Appendix A.

SUPERSTRUCTURE DESIGN OPTION 1

MAT01_CD_SUPERS_OPT2

CHANGE

Baseline	Alternative
Upper Floor • **Structural steel profiles**, generic, 20% recycled (columns and beams of for the upper floors only) **Assumed 45 kg/m²** for upper floor GIA • **Galvanized profiled steel decking**, for composite floor slabs/decks, 0.9 mm sheet thickness • **Steel mesh reinforcement** for concrete • **Concrete** – C32/40, CEM I, 0% recycled binders, 150mm thick • **Raised access floor**	**Upper Floor** • **Structural steel profiles**, generic, 20% recycled (columns and beams of for the upper floors only) **Assumed 25kg/m²** for upper floor GIA • **Hollow core concrete slabs** - Assumed 250mm thick, C30/37, 0% recycled binders in cement • **Flooring screed** - 50mm thick, C20/25, CEM I 0% Cement Replacement • **Assumed NO Raised access floor** (as service runs can be allowed for within screed detailing)

RESULT

Material Option	Tonnes CO_2e	Difference (Tonnes CO_2e)	Lowest CO_2e
Baseline	1,383		✗
Alternative	1,271	- 112	✓

SUPERSTRUCTURE DESIGN OPTION 2

MAT01_CD_SUPERS_OPT3

CHANGE

<table>
<tr><th>Baseline</th><th>Alternative</th></tr>
<tr><td>Upper Floor
• Structural steel profiles, generic, 20% recycled (columns and beams of for the upper floors only) Assumed 45 kg/m² for upper floor GIA
• Galvanized profiled steel decking, for composite floor slabs/decks, 0.9 mm sheet thickness
• Steel mesh reinforcement for concrete
• Concrete – C32/40, CEM I, 0% recycled binders, 150mm thick
• Raised access floor</td><td>Upper Floor
• Glue laminated timber (Glulam) - Assumed 100 kg/m² for upper floor GIA, NB: FSC certified timber, and a detailed disassembly plan made, to promote reuse at end of building life
• 200mm joists - Assumed 1.8m of joists per m²
• 22mm chipboard - Assumed 14.57 kg/m²
• Soffit lining/fire protection:
i) 2 x Gypsum plasterboard, fire resistant, 12.5 mm
ii) 200mm of Rock wool/mineral wool insulation, Fire resistance class = A
• No raised access floor needed</td></tr>
</table>

RESULT

Material Option	Tonnes CO_2e	Difference (Tonnes CO_2e)	Lowest CO_2e
Baseline	1,383		✗
Alternative	1,234	- 149	✓

SUPERSTRUCTURE DESIGN OPTION 3

MAT01_CD_SUPERS_OPT4

CHANGE

Baseline	Alternative
Steel Frame • **Structural steel profiles,** generic, 20% recycled (Hot rolled) • **Structural hollow steel** Generic 20% (Cold rolled)	**Timber Frames** • **Glue laminated timber (Glulam)** - Assumed 70 kg/m² for ground floor GIA, NB: FSC certified timber, and a detailed disassembly plan made, to promote reuse at end of building life
Upper Floor • **Structural steel profiles**, generic, 20% recycled (columns and beams of for the upper floors only) Assumed 45 kg/m² for upper floor GIA • **Galvanized profiled steel decking**, for composite floor slabs/decks, 0.9 mm sheet thickness • **Steel mesh reinforcement** for concrete • **Concrete** – C32/40, CEM I, 0% recycled binders, 150mm thick • **Raised access floor**	**Upper Floor** • **Glue laminated timber (Glulam)** - Assumed 100 kg/m² for upper floor GIA • **200mm joists** - Assumed 1.8m of joists per m² • **22mm chipboard** - Assumed 14.57 kg/m² • **Sofit lining/fire protection:** i) 2 x Gypsum plasterboard, fire resistant, 12.5 mm ii) 200mm of Rock wool/mineral wool insulation, Fire resistance class = A • **No raised access floor needed**

RESULT

Material Option	Tonnes CO_2e	Difference (Tonnes CO_2e)	Lowest CO_2e
Baseline	1,383		✗
Alternative	683	-700	✓

SUBSTRUCTURE OPTION APPRAISAL DURING CONCEPT DESIGN

SUBSTRUCTURE BASELINE

MAT01_CD_SUBS_HL_OPT1

The substructure base-build has been modelled within the software. The building material inputs can be seen in Appendix A.

SUBSTRUCTURE DESIGN OPTION 2

MAT01_CD_SUBS_HL_OPT3

CHANGE

Baseline	Alternative
Lowest Floor Construction • **Concrete -** Assumptions: C32/40, CEM I, 0% recycled binders	**Lowest Floor Construction** • **Concrete** - Assumptions: C32/40, CEM I, 0% recycled binders, **15% thinner ground floor slab**

RESULT

Material Option	Tonnes CO_2e	Difference (Tonnes CO_2e)	Lowest CO_2e
Baseline	384		✗
Alternative	340	-44.0	✓

SUBSTRUCTURE DESIGN OPTION 2

MAT01_CD_SUBS_HL_OPT4

CHANGE

Baseline	Alternative
Standard Foundations • **Concrete** - Assumptions: C32/40, CEM I, 0% recycled binders • Steel reinforcement	**Standard Foundations** • **Concrete** - Reduced Foundations Size Due to Structural Timber Lighter Loads (circa 20% saving) • Steel reinforcement

RESULT

Material Option	Tonnes CO_2e	Difference (Tonnes CO_2e)	Lowest CO_2e
Baseline	384		✗
Alternative	369	-15	✓

HARD LANDSCAPING OPTION APPRAISAL DURING CONCEPT DESIGN

HARD LANDSCAPING BASELINE

MAT01_CD_SUBS_HL_OPT2

The hard landscaping base-build has been modelled within the software. The building material inputs can be seen in Appendix A.

HARD LANDSCAPING DESIGN OPTION 1

MAT01_CD_SUBS_HL_OPT5

CHANGE

Baseline	Alternative
Tarmac 550mm build up of: • 350mm crushed aggregate sub-base • 70mm AC 32 • 60mm AC20 and • 40mm surface course	**Paving** 550mm build up of: Block Paver • 350mm crushed aggregate sub-base • 60mm AC 20 • 50mm sand bedding • 80mm block paver

RESULT

Material Option	Tonnes CO_2e	Difference (Tonnes CO_2e)	Lowest CO_2e
Baseline	273		✗
Alternative	260	-13	✓

HARD LANDSCAPING DESIGN OPTION 2

MAT01_CD_SUBS_HL_OPT6

CHANGE

Baseline	Alternative
Tarmac 550mm build up of: • 350mm crushed aggregate sub-base • 70mm AC 32 • 60mm AC20 and • 40mm surface course	**Paving** 550mm build up of: Block Paver • 330mm crushed aggregate sub-base • 60mm AC20 • 50mm sand bedding 100mm open grid paver (with 40% openness)

RESULT

Material Option	Tonnes CO_2e	Difference (Tonnes CO_2e)	Lowest CO_2e
Baseline	273		✘
Alternative	257	-16	✓

BREEAM NC V6 MAT 01 CREDITS

The Mat 01 Results Submission Tool has been completed and confirms that a total of **4 credits** can be awarded at the **concept design stage**, as follows:

- BREEAM benchmark comparison = 0.7 credits
- Superstructure options appraisal = 2.67 credits
- Substructure and hard landscaping options appraisal = 1 credit

In addition to this it is expected that the following will also be undertaken:

- Third party verification of the LCA model & report at concept stage = 1 exemplary credit
- Alignment of the LCA and the LCC at concept stage = 1 exemplary credit

Therefore, a total of 4 credits have been achieved and it is anticipated that a further 2 exemplary credits will also be achievable.

		CO_2e Tonnes	CO_2e per m^2/yr	Difference Tonnes	Difference %	Result
Superstructure	Baseline	1383	4.54	-	-	-
	Design Option 1	1271	4.18	-112.00	-8.10	✓
	Design Option 2	1234	4.06	-149.00	-10.77	✓
	Design Option 3	683	2.24	-700.00	-50.61	✓
Substructure	Baseline	384	1.26	-	-	-
	Design Option 1	340	1.12	-44.00	-11.46	✓
	Design Option 2	369	1.21	-15.00	-3.91	✓
Hard Landscaping	Baseline	273	0.9	-	-	-
	Design Option 1	260	0.85	-13.00	-4.76	✓
	Design Option 2	257	0.84	-16.00	-5.86	✓

Engineering Services Consultancy Ltd

02 February 2024

APPENDIX A

Main > ESS0416 Plot B Windrush Units 18-20 LCA > Mat01_CD_SuperS_Opt1 > LCA for BREEAM UK > Input data : Building materials

Mat01_CD_SuperS_Opt1

Building materials | Energy consumption, annual | Water consumption, annual | Construction site operations | Emissions and removals | Building area

Material	Country	Data source	Type	Upstream	CO2e	Unit	Standard
Filter:	Filter:	Filter:	Filter:	Filter:	Filter:	Filter:	Filter:

Clear

Fill in the material consumptions by material type. You may fill in all materials lumped together, or on separate rows for example by type of structure. Unless instructed otherwise, use gross amounts (incl. losses). Materials can be added in any section. Material selection help.

Completeness (%) and plausibility checker (-)

1. Foundations and substructure
- out of scope - Add to scope

2. Vertical structures and facade
840 Tonnes CO_2e - 61 %

External walls and facade Compare answers | Create a group | Move materials | Add to compare

Start typing or click the arro

Resource	Quantity	Unit	CO_2e	Comment	RICS category	Transport, kilometers	
Sandwich panel with glasswool insul	1218	m2	67t - 5%	External wall - Built up	2.5.1.External enclosing	80	Trailer combination, 40
Sandwich panel with stone wool i	2510	m2	128t - 9%	External wall - Composite	2.5.1.External enclosing	80	Trailer combination, 40

Columns and load-bearing vertical structures Compare answers | Create a group | Move materials | Add to compare

Start typing or click the arro

Resource	Quantity	Unit	CO_2e	Comment	RICS category	Transport, kilometers		Serv
Structural steel profiles, generic,	202950	kg	518t - 37%	Steel frame - hot rolled	2.1. Frame	110	Trailer combination, 40	As bu
Structural hollow steel sections (H	45100	kg	126t - 9%	Steel frame - cold rtolled	2.1.1.Steel frames	110	Trailer combination, 40	As bu

Internal walls and non-bearing structures Compare answers | Create a group | Move materials | Add to compare

Start typing or click the arro

3. Horizontal structures: beams, floors and roofs
491 Tonnes CO_2e - 36 %

Floor slabs, ceilings, roofing decks, beams and roof Compare answers | Create a group | Move materials | Add to compare

Start typing or click the arro

Resource	Quantity	Unit	CO_2e	Comment	RICS category	Transport, kilometers	
Structural steel profiles, generic,	25290	kg	65t - 5%	Upper Floor Structural Steel	2.2.Upper floor	110	Trailer combination, 40
Profiled steel decking for compo	562	m2	18t - 1%	Upper floor - Metal deck	2.2.1.Floors	110	Trailer combination, 40
Reinforcement steel mesh (rebar), 1	1697.24	kg	1.3t - 0.1%	Upper floor - Reinforcement	2.2.1.Floors	110	Trailer combination, 40
Ready-mix concrete, normal strength	84.3	m3	27t - 2%	Upper floor - Concrete	2.2.Upper floor	60	Concrete mixer truck
Raised access floor pedestals, for	1168.96	kg	4.5t - 0.3%	Raised access floor feet	3.2.2.Raised access	110	Trailer combination, 40
Raised access flooring panels, chip	562	m2	68t - 5%	Raised access floor panels	3.2.2.Raised access	110	Trailer combination, 40
Sandwich panel with glasswool insul	4781	m2	264t - 19%	Roof	2.3.Roofs	80	Trailer combination, 40
Corrugated rooflight GRP sheets, 5.	478	m2	43t - 3%	Rooflights	2.3.5.Rooflights	80	Trailer combination, 40

4. Other structures and materials
52 Tonnes CO_2e - 4 %

Other structures and materials ⇄ Compare answers ▾ Create a group ✣ Move materials Add to compare

Start typing or click the arro

Resource	Quantity		CO_2e	Comment	RICS category	Transport, kilometers		Ser
Precast concrete staircase, 2 fligh ?	63529	kg	12t - 0.9%	Precast Stair	2.4.Stairs and ramps	60	Trailer combination, 40	As

Windows and doors ⇄ Compare answers ▾ Create a group ✣ Move materials Add to compare

Start typing or click the arro

Resource	Quantity		CO_2e	Comment	RICS category	Transport, kilometers	
Aluminium frame window, double glaz ?	305	m2	40t - 3%	Window	2.6.Windows and external	130	Trailer combination, 4

Finishes and coverings ⇄ Compare answers ▾ Create a group ✣ Move materials Add to compare

Main > ESS0416 Plot B Windrush Units 18-20 LCA > Mat01_CD_SubS_HL_Opt1 > LCA for BREEAM UK > Input data : Building materials

Mat01_CD_SubS_HL_Opt1

Building materials | Energy consumption, annual | Water consumption, annual | Construction site operations | Emissions and removals | Building area

	Material	Country	Data source	Type	Upstream	CO2e	Unit	Standard
Clear	Filter:	Filter:	Filter:	Filter:	Filter:	Filter:	Filter:	Filter:

Fill in the material consumptions by material type. You may fill in all materials lumped together, or on separate rows for example by type of structure. Unless instructed otherwise, use gross amounts (incl. losses). Materials can be added in any section. Material selection help.

Completeness (%) and plausibility checker (-)

1. Foundations and substructure

384 Tonnes CO_2e - 100 %

Materials in the foundations will never be replaced, no matter assessment period length (except for RE2020 and FEC tools). For BREEAM UK Mat 1 IMPACT equivalent provide the data for site excavation fuel use here, choose resource Excavation works.

Foundation, sub-surface, basement and retaining walls ⇄ Compare answers ▾ Create a group ✣ Move materials Add to compare

Start typing or click the arro

Resource	Quantity		CO_2e	Comment	RICS category	Transport, kilometers		Se
Ready-mix concrete, normal strength ?	202.5	m3	65t - 17%	Foundations - concrete	1.Substructure	60	Concrete mixer truck	Pe
Reinforcement steel (rebar), generi ?	20250	kg	11t - 3%	Foundations - Steel	1.1.1.Standard	110	Trailer combination, 40	Pe
Ready-mix concrete, normal strength ?	902	m3	291t - 76%	Ground Floor Slab -	1.1.3.Lowest floor	60	Concrete mixer truck	Pe
Reinforcement steel (rebar), generi ?	31570	kg	17t - 4%	Ground Floor Slab - Steel	1.1.3.Lowest floor	110	Trailer combination, 40	Pe

Main > ESS0416 Plot B Windrush Units 18-20 LCA > Mat01_CD_SubS_HL_Opt2 > LCA for BREEAM UK > Input data : Building materials

Mat01_CD_SubS_HL_Opt2

Building materials | Energy consumption, annual | Water consumption, annual | Construction site operations | Emissions and removals | Building area

Clear	Material	Country	Data source	Type	Upstream	CO2e	Unit	Standard
	Filter:	Filter:	Filter:	Filter:	Filter:	Filter:	Filter:	Filter:

Fill in the material consumptions by material type. You may fill in all materials lumped together, or on separate rows for example by type of structure. Unless instructed otherwise, use gross amounts (incl. losses). Materials can be added in any section. Material selection help.

Completeness (%) and plausibility checker (-)

1. Foundations and substructure

Materials in the foundations will never be replaced, no matter assessment period length (except for RE2020 and FEC tools). For BREEAM UK Mat 1 IMPACT equivalent provide the data for site excavation fuel use here, choose resource Excavation works.

Foundation, sub-surface, basement and retaining walls ⇄ Compare answers · Create a group · Move materials · Add to compare

Start typing or click the arro

2. Vertical structures and facade - out of scope - Add to scope

3. Horizontal structures: beams, floors and roofs - out of scope - Add to scope

4. Other structures and materials - out of scope - Add to scope

5. External areas and site elements

273 Tonnes CO_2e - 100 %

Materials and constructions for external areas ⇄ Compare answers · Create a group · Move materials · Add to compare

Start typing or click the arro

Resource	Quantity					CO_2e	Comment	RICS category	Transport, kilometers	
Asphalt concrete base course ?	1055	m^2				27t - 10%	Access road - 90mm AC32	8.2.1.Roads, paths and	Data by constituent	
Asphalt concrete base course ?	1055	m^2				18t - 7%	Access road - 60mm AC20	8.2.1.Roads, paths and	Data by constituent	
Asphalt, generic, compacted, 5/95% ?	1055	m2	x	40	mm	16t - 6%	Access road - 40mm	8.2.1.Roads, paths and	30	Dumper truck, 19 ton
Aggregate (crushed gravel), generic ?	1055	m2	x	250	mm	2.9t - 1%	Access road - Sub-base -	8.2.1.Roads, paths and	60	Dumper truck, 19 ton
Ready-mix concrete, normal strength ?	2357	m2	x	200	mm	152t - 56%	Service Yard - Concrete	8.2.1.Roads, paths and	60	Concrete mixer truck
Reinforcement steel (rebar), generi ?	16499	kg				9t - 3%	Service Yard - Steel	8.2.1.Roads, paths and	110	Trailer combination, 40
Asphalt concrete base course ?	751	m^2				13t - 5%	Car Park - 60mm AC20	8.2.1.Roads, paths and	Data by constituent	
Asphalt, generic, compacted, 5/95% ?	751	m2	x	40	mm	11t - 4%	Car park bays - 40mm	8.2.1.Roads, paths and	30	Dumper truck, 19 ton
Asphalt concrete base course ?	751	m^2				15t - 6%	Car park circulation - 70mm	8.2.1.Roads, paths and	Data by constituent	
Aggregate (crushed gravel), generic ?	751	m2	x	350	mm	2.9t - 1%	Car park circulation-	8.2.1.Roads, paths and	60	Dumper truck, 19 ton
Concrete paving blocks, semi dry mi ?	406	m2	x	60	mm	5.1t - 2%	Footpaths - block paving	8.2.1.Roads, paths and	60	Trailer combination, 40
Sand, compacted dry density, 1682 k ?	406	m2	x	50	mm	0.23t - 0.1%	Footpaths - bedding sand	8.2.1.Roads, paths and	60	Dumper truck, 19 ton
Aggregate (crushed gravel), generic ?	406	m2	x	150	mm	0.46t - 0.2%	Footpaths - aggregate	8.2.1.Roads, paths and	30	Dumper truck, 19 ton