

Designer Embodied Carbon (EC) Calculation - Civil & Electrical	
Build Table Most Contributing Materials 1%>. Embodied Carbon A1-5	
Project Name:	Kirby Lonsdale
Project Scope:	33kV Switchgear (CB's) Replacement

Project Embodied Carbon Breakdown and Totals t(CO2e):	
Total A1-5w	198.5384335
A5a	10.53
Total A1-5 t(CO2e)	209.07

Calculation Date:	01/10/2025
Project Code:	50017694
Project Completed in Financial Year:	2025
Estimated Cost of Civil Build(£): (To Estimate A5a)	£1,504,098

Structural timber: in Tonnes, (To Calculate Sequestration Value)	0
Sequestration Value t(CO2e):	0

Design Values														Notes/ Comments
Embodied Carbon t(CO2e)				ECF kg(CO2e/kg)			Embodied Carbon t(CO2e)				Total EC t(CO2e)			
Stage of works	Material	Units values to input in conversion to tonnes cell	Conversion to Tonnes	Quantity(t)	A1-3	A4	A5w	A1-3	A4	A5w	A1-5w	A1-5w		
Foundation Excavation & Backfill	Soil assumed 5% cement content. 1m3 = 1.9 tonnes of clay soil. Ref:	input value in m3 (in 'conversion to tonnes' cell)	124	287.928	0.061	0.005	0.004452	17.564	1.4396	1.2819	20.28510346	Foundation Excavation & Backfill	20.28510346	Foundation
Foundation	Asphalt, 8% (Bitumen) binder content (by mass) weighted @ 2322kg / m3	input value in m3 (in 'conversion to tonnes' cell)	0	0	0.086	0.005	0.005777	0	0	0	0	0	0	
	PVC Pipes (Waste water) weight @ 0.72kg / m	input value in meters (in 'conversion to tonnes' cell)	11	0.00792	3.23	0.005	0.172409	0.0256	4E-05	0.0014	0.026986679	0.026986679	0	
	Concrete Kerb 26.74 linear meters per m3	input value in m3 (in 'conversion to tonnes' cell)	0	0	0.188	0.005	0.00211	0	0	0	0	0	0	
	Limestone Aggregate, 2650kg/m3	input value in m3 (in 'conversion to tonnes' cell)	24.5	64.925	0.005	0.005	0.001484	0.3246	0.3246	0.0963	0.7455987	0.7455987	0	
Reinforced Concrete	Ready mix concrete 32/40. 2350kg / m3	input value in m3 (in 'conversion to tonnes' cell)	30	70.5	0.132	0.005	0.008215	9.306	0.3525	0.5792	10.2376575	10.2376575	Reinforced Concrete	
	Rebar (New) weighted @ H10 = 0.62kg / m	input value in kg (in 'conversion to tonnes' cell)	203	0.203	2.77	0.032	0.14946	0.5623	0.0065	0.0303	0.59914638	0.59914638		
	Rebar (New) weighted @ H12 = 0.89kg / m	input value in kg (in 'conversion to tonnes' cell)	620	0.62	2.77	0.032	0.14946	1.7174	0.0198	0.0927	1.8299052	1.8299052		
	Rebar (New) weighted @ H16 = 1.58kg / m	input value in kg (in 'conversion to tonnes' cell)	60	0.06	2.77	1.032	0.20246	0.1662	0.0619	0.0121	0.2402676	0.2402676		
	Rebar (New) weighted @ A393 mesh 6.6kg / m²	input value in kg (in 'conversion to tonnes' cell)	1400	1.4	2.77	0.032	0.14946	3.878	0.0448	0.2092	4.132044	4.132044		
Steel works	Stainless Steel Windposts Grade 304 weighted @ 37.5kg / m	input value in meters (in 'conversion to tonnes' cell)	0	0	6.15	0.032	0.062	0	0	0	0	Steel works	0	
	Steel General (New) weighted @ 7900kg / m3 (contractor weights for materials on steel is a must)	input value in kg (in 'conversion to tonnes' cell)	2450	2.45	2.89	0.032	0.0294	7.0805	0.0784	0.072	7.23093		7.23093	
	Mild Steel Fencing weighted @ 25kg per linear meter	input value in meters (in 'conversion to tonnes' cell)	0	0	1.53	0.005	0.01553	0	0	0	0		0	
Superstructure	Clay Brick (2000kg / m3)	input value in kg (in 'conversion to tonnes' cell)	0	0	0.24	0.005	0.06575	0	0	0	0	Superstructure	0	
	Container	input value in kg (in 'conversion to tonnes' cell)	25380	25.38	2.46	0.032	0.6275	62.435	0.8122	15.926	79.17291		79.17291	
	Louvres RSH5700 edition / weighted @ 25kg/m2 (Assumed aluminium frame)	input value in kg (in 'conversion to tonnes' cell)	0	0.4	0.46	0.032	0.0051	0.184	0.0128	0.002	0.19884		0.19884	
	Mineral wool insulation, Rockwool RW3, weighted at 60kg/m3	input value in kg (in 'conversion to tonnes' cell)	0	6	1.28	0.005	0.069059	7.68	0.03	0.4144	8.124354		8.124354	
	Autoclaved Aerated Concrete Block 600kg / m3	input value in kg (in 'conversion to tonnes' cell)	0	0	0.375	0.005	0.0995	0	0	0	0		0	
Roof	Timber truss weight @ 3kg / m	input value in kg (in 'conversion to tonnes' cell)	0	0	0.42	0.005	0.12847	0	0	0	0	Roof	0	
	Concrete roof tiles weighted @ 3kg / m2	input value in kg (in 'conversion to tonnes' cell)	0	0	0.1	0.005	0.00123	0	0	0	0		0	
	Concrete Roof Columns weighted @ 355kg / m	input value in meters (in 'conversion to tonnes' cell)	0	0	0.188	0.005	0.00211	0	0	0	0		0	
	PVC Pipes (weight @ 0.72kg / m)	input value in meters (in 'conversion to tonnes' cell)	0	0	3.23	0.005	0.172409	0	0	0	0		0	
Cable Excavation & Backfill	Soil assumed 5% cement content. 1m3 = 1.9 tonnes of clay soil. Ref: (https://coolconversion.com/volume-mass-construction/~1-cubic-meter-of-clay-soil-to-tonne)	input value in m3 (in 'conversion to tonnes' cell)	127.5	242.25	0.061	0.005	0.004452	14.777	1.2113	1.0785	17.066997	Cable Excavation & Backfill	17.066997	Cables
Cables	Cable Ducts PVC-3 Phases -ave weight 3.3kg / m	input value in meters (in 'conversion to tonnes' cell)	0	0	3.23	0.005	0.172409	0	0	0	0	0	0	
	Single Core Cable 33kV - 3 Phases : ave weight @ 15.6kg/m	input value in meters (in 'conversion to tonnes' cell)	297	4.6332	3.8100	0.16	0.03988	17.652	0.7413	0.1848	18.57857602	18.57857602		
	Single Core Cable 6.6 / 11kV - 3 Phases : av weight @ xxkg/m	input value in meters (in 'conversion to tonnes' cell)	0	0	3.8100	0.032	0.0386	0	0	0	0	0	0	
	Multicore Cable : av weight @ 1.5kg/m	input value in meters (in 'conversion to tonnes' cell)	552.86	0.83	3.7000	0.032	0.0375	3.0684	0.0265	0.0311	3.1259925	3.1259925		
Transformers	Transformer 33kV	input value in Tonnes (in 'conversion to tonnes' cell)	0	0		0.16	0.00178	0	0	0	0	Transformers	0	
	Transformer 132kV	input value in Tonnes (in 'conversion to tonnes' cell)	0	0		0.16	0.00178	0	0	0	0		0	
	Transformer EAT	input value in Tonnes (in 'conversion to tonnes' cell)	0	0		0.16	0.00178	0	0	0	0		0	
Switch Gear	33kV Switchgear: ave weight 730kg	input value in Tonnes (in 'conversion to tonnes' cell)	9	6.57	3.5429	0.5173	0.0408	23.277	3.3985	0.2679	26.9431245	Switch Gear	26.9431245	
	Protection Panels: ave weight 260kg	input value in Tonnes (in 'conversion to tonnes' cell)	0	0	3.0300	0.032	0.0308	0	0	0	0		0	
	Switch Gear 3	input value in Tonnes (in 'conversion to tonnes' cell)	0	0		0.16	0.00178	0	0	0	0		0	
	Switch Gear 4	input value in Tonnes (in 'conversion to tonnes' cell)	0	0		0.16	0.00178	0	0	0	0		0	
	Switch Gear 5	input value in Tonnes (in 'conversion to tonnes' cell)	0	0		0.16	0.00178	0	0	0	0		0	
	Switch Gear 6	input value in Tonnes (in 'conversion to tonnes' cell)	0	0		0.16	0.00178	0	0	0	0		0	

Calculation Notes:	
Weight of structural Timber (Excluding temp works):	tonnes
Weight of Temporary Timber (formworks, Assumed reuse):	tonnes
Foundation -Trench Excavations	At Length[] m x Width[] m x Depth[] m = [] m3
Cables - Trench Excavtions	At Length[] m x Width[] m x Depth[] m = [] m3
Power Cable circuit lengths	[] meter lengths

Important note: All materials calculated in above sheet, includes only imported materials

Key:	A1-3	Calculation are based on Embodied Carbon Factors (ECF) to Extract & Manufacture the material Calculated as: Tonnes x ECF kg(CO2e/kg) = Embodied Carbon t(CO2e). Sourced IStructE
	A4	Calculation based on kg of CO2e produced by Distance travelled in km. ECF based on: Tonnes x ECF kg(CO2e/kg) = Embodied Carbon t(CO2e). Distances referenced from IStructE: Locally sourced within 50km = 0.005kg(CO2e) / Nationally Sourced within 320km = 0.32kg(COe) / European sourced within 1500km = 0.16kg(CO2e): Sourced IStructE
	A5w	Calculation based on the Waste Factor (WF) of Materials. So brick has a waste factor of 20%, Steel 1% etc...: Material WFx(Material ECF x Distance Travelled x Distance travelled forwaste material taken to landfill (C2) x CO2 used for processing disposal (C3-4) = A5w / Example, assumed waste of concrete is : 0.053 x (A1-3 x x A4 x C2 x C3-4) = A5w : Sourced IStructE
	5a	Typical assumed costat stage A1-5 of build is 50% so: 700kg(CO2e) per £100,000 so: 0.7 x (cost of build + 100,000)= Ans t(CO2e): Sourced IStructE

Key:	Designer to fill in all cells highlighted in light grey				Reference note:	Calculations & Embodied Carbon factors for materials used in the tableare sourced from the Brrisa (ICE) & IstructE
The 'Embodied Carbon (CO2e)' cells are using a traffic light system to indicate, low- high contributing materials. Below this cell in an example of how the colour format works and what they indicate.					Ref for material Embodied Carbon Factors: A BSRIA guide: Hammond.G etal., 'Embodied Carbon', The inventory of Cabon and Energy,, (ICE).	
Low	Medium		High			Ref for calculating Embodied Carbon A1-5: Cell colour formatting:
0	12.5	25	37.5	50		
The notes table to the left can be used to help breakdown and review calculations. The structural timber values in tonnes can be used to calculate the sequestration value, this is used to calculate the amount of carbon storage throughout the builds life cycle Example: 20 tonnes of structural timer x -1.64 kg(CO2e) = -32.8t(CO2e). For more information see notes calculation A1-5 on the tab below.						

