

Designer Embodied Carbon (EC) Calculation - Civil & Electrical	
Build Table Most Contributing Materials 1%>. Embodied Carbon A1-5	
Project Name:	Keswick Primary
Project Scope:	11kV switchgear replacement - In Situ after switchgear fault.

Project Embodied Carbon Breakdown and Totals t(Co2e):			Calculation Date:		01/10/2025				
Total A1-5w			Project Code:		60000393				
A5a			Project Completed in Financial Year:		2025				
Total A1-5 t(CO2e)			Estimated Cost of Civil Build(£): (To Estimate A5a)		£1,101,858				
		Note: Total A1-5t(CO2e): Total A1-5w + A5a = Ans				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)	60	139.32	0.061	0.005	0.004452	8.4985	0.6966	0.6203	9.81537264	Foundation Excavation & Backfill	9.81537264		
Foundation	Asphalt, 8% (Bitumen) binder content (by mass) weight @ 2322kg / m3	input value in m3 (in 'conversion to tonnes' cell)	0	0	0.086	0.005	0.005777	0	0	0	0	Foundation	0		
	PVC Pipes (Waste water) 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		
	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		
	Limestone Aggregate, 2650kg/m3	input value in m3 (in 'conversion to tonnes' cell)	8	21.2	0.005	0.005	0.001484	0.106	0.106	0.0315	0.2434608		0.2434608		
Reinforced Concrete	Ready mix concrete 32/40. 2350kg / m3	input value in m3 (in 'conversion to tonnes' cell)	15.1	35.485	0.132	0.005	0.008215	4.684	0.1774	0.2915	5.152954275	Reinforced Concrete	5.152954275		
	Rebar (New) weight @ H10 = 0.62kg / m	input value in kg (in 'conversion to tonnes' cell)	1230	1.23	2.77	0.032	0.14946	3.4071	0.0394	0.1838	3.6302958		3.6302958		
	Rebar (New) weight @ H12 = 0.89kg / m	input value in kg (in 'conversion to tonnes' cell)	442.5	0.4425	2.77	0.032	0.14946	1.2257	0.0142	0.0661	1.30602105		1.30602105		
	Rebar (New) weight @ H16 = 1.58kg / m	input value in kg (in 'conversion to tonnes' cell)	12	0.012	2.77	0.032	0.14946	0.0332	0.0004	0.0018	0.03541752		0.03541752		
Steel works	Stainless Steel Windposts Grade 304 weight @ 37.5kg / m	input value in meters (in 'conversion to tonnes' cell)	6	0.225	6.15	0.032	0.062	1.3838	0.0072	0.014	1.4049	Steel works	1.4049		
	Steel General (New) weight @ 7900kg / m3 (contractor weights for materials on steel is a must)	input value in kg (in 'conversion to tonnes' cell)	380	0.38	2.89	0.032	0.0294	1.0982	0.0122	0.0112	1.121532		1.121532		
	Mild Steel Fencing weight @ 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		
	Louvers RSH5700 edition / weight @ 25kg/m2 (Assumed aluminium frame)	input value in kg (in 'conversion to tonnes' cell)	0	0	12.79	0.032	0.1284	0	0	0	0		0		
	Mineral wool insulation, Rockwool RW3, weight at 60kg/m3	input value in kg (in 'conversion to tonnes' cell)	0	0	1.28	0.005	0.069059	0	0	0	0		0		
	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 weight @ 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 weight @ 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)	55	104.5	0.061	0.005	0.004452	6.3745	0.5225	0.4652	7.362234	Cable Excavation & Backfill	7.362234		
	Cable Ducts PVC-3 Phases -ave weight 3.3kg / m	input value in meters (in 'conversion to tonnes' cell)	33	0.1089	3.23	0.005	0.172409	0.3517	0.0005	0.0188	0.37106684		0.37106684		
	Single Core Cable 33kV - 3 Phases : ave weight @ 15.6kg/m	input value in meters (in 'conversion to tonnes' cell)	0	0	3.81	0.16	0.211364	0	0	0	0		0		
	Single Core Cable 6.6 / 11kV - 3 Phases : av weight @ 13.6kg/m	input value in meters (in 'conversion to tonnes' cell)	91	1.24	3.81	0.032	0.0386	4.721	0.0397	0.0478	4.808494578		4.808494578		
	Multicore Cable : av weight @ 1.5kg/m	input value in meters (in 'conversion to tonnes' cell)	200	0.3	3.7	0.032	0.0375	1.11	0.0096	0.0113	1.13085		1.13085		
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	6.6/11kV Switchgear: ave weight 600kg	input value in Tonnes (in 'conversion to tonnes' cell)	10	3.45	3.5429	0.032	0.0359288	12.223	0.1104	0.124	12.4572789	Switch Gear	12.4572789		
	Protection Panels: ave weight 260kg	input value in Tonnes (in 'conversion to tonnes' cell)	1	0.26	3.03	0.16	0.03208	0.7878	0.0416	0.0083	0.8377408		0.8377408		
	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	A1 Length[] m x Width[] m x Depth[] m = [] m3
Cables - Trench Excavtions	A1 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 table are sourced from the Brisa (ICE) & ISTRUCTE
The 'Embodied Carbon t(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 et al., 'Embodied Carbon', The inventory of Carbon and Energy., (ICE).	Embodied Carbon - The Inventory of Carbon and Energy (ICE) (greenbuildingencyclopedia.uk)
Low		Medium		High		
0	12.5	25	37.5	50	Ref for calculating Embodied Carbon A1-5& Cell colour formatting:	The Institution of Structural Engineers 'How to calculate embodied carbon'.
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 timber x -1.64 kg(CO2e) = -32.8t(CO2e). For more information see notes calculation A1-5 on the tab below.					A brief guide to calculating embodied carbon. (Istructe.org)	

