

Designer Embodied Carbon (EC) Calculation - Civil & Electrical	
Build Table Most Contributing Materials 1%+. Embodied Carbon A1-5	
Project Name:	Hutton End
Project Scope:	11kV Switchgear Replacement using Schneider Genie Evo switchgear, In Situ Replacement.
Project Embodied Carbon Breakdown and Totals (tCO2e):	
Total A1-5w	39.97
A5a	1.41
Total A1-5 (tCO2e)	41.38
Note: Total A1-5(tCO2e): Total A1-5w + A5a + Ans	
Calculation Date:	18/09/2024
Project Code:	50021895
Project Completed in Financial Year:	FY24
Estimated Cost of Civil Build (£):	£202,000.00
Structural timber: in Tonnes, (To Calculate Sequestration Value)	0
Sequestration Value (tCO2e):	0

Design Values													
Stage of works	Material	Units values to input in conversion to tonnes cell	Conversion to Tonnes	Quantity(t)	ECF kg(CO2e/kg)			Embodied Carbon (CO2e)				Notes/ Comments	
					A1-3	A4	A5w	A1-3	A4	A5w	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)	17	39.474	0.061	0.005	0.00452	2.4079	0.1974	0.1757	2.781022248	Foundation Excavation & Backfill	2.781022248
Foundation	Asphalt, 8% (Blumen) binder content (by mass) weight @ 2322kg/m3	Input value in m3 (in conversion to tonnes cell)	1.448	3.362256	0.086	0.005	0.005777	0.2892	0.0168	0.0194	0.325389049	Foundation	0.325389049
	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 28.74 linear meters per m3	Input value in m3 (in conversion to tonnes cell)	0.2	0.2	0.188	0.005	0.00211	0.0376	0.001	0.0004	0.039022		0.039022
Reinforced Concrete	Limestone Aggregate, 2052kg/m3	Input value in m3 (in conversion to tonnes cell)	40.4	107.06	0.005	0.005	0.001484	1.5353	0.5353	0.1589	1.22947704	Reinforced Concrete	1.22947704
	Ready mix concrete 3249/2350kg/m3	Input value in m3 (in conversion to tonnes cell)	13	30.55	0.132	0.005	0.008215	4.0326	0.1528	0.251	4.43631825		4.43631825
	Rebar (New) weight @ H10 = 0.62kg/m	Input value in kg (in conversion to tonnes cell)	429	0.429	2.77	0.032	0.14946	1.1883	0.0137	0.0641	1.26617634		1.26617634
	Rebar (New) weight @ H12 = 0.89kg/m	Input value in kg (in conversion to tonnes cell)	0	0	2.77	0.032	0.14946	0	0	0	0		0
Steelwork	Rebar (New) weight @ H20 = 2.47kg/m	Input value in kg (in conversion to tonnes cell)	0	0	2.77	0.032	0.14946	0	0	0	0	0	
	Stainless Steel Wiremesh Grade 304 weight @ 37.2kg/m	Input value in meters (in conversion to tonnes cell)	3	0.1125	6.15	0.032	0.062	0.6919	0.0036	0.007	0.70245	Steelwork	0.70245
	Steel General (New) weight @ 7900kg/m3 (contractor weights for materials on steel is a must)	Input value in kg (in conversion to tonnes cell)	0	0	2.89	0.032	0.0294	0	0	0	0		0
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)	410	0.41	0.24	0.005	0.06575	0.0984	0.0021	0.027	0.1274075	Superstructure	0.1274075
	Louvers R5H0700 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 RWS, weight @ 60kg/m3	Input value in kg (in conversion to tonnes cell)	0	0	1.28	0.005	0.065059	0	0	0	0		0
Roof	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	
	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	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	
Cables	Concrete Roof Columns weight @ 305kg/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	
	Soil assumed 5% cement content, 1m3 = 1.9 tonnes of clay soil. Ref: (https://www.construction.com/resources/special/construction-1-cubic-meter-of-clay-soil-to-tons)	Input value in m3 (in conversion to tonnes cell)	80	15.2	0.061	0.005	0.004452	0.9272	0.076	0.0677	1.0708704	Excavation & Backfill	1.0708704
Transformers	Cable Ducts PVC 3 Phase weight 3.3kg/m	Input value in meters (in conversion to tonnes cell)	200	0.66	3.23	0.005	0.172409	2.1318	0.0033	0.1138	2.24888994	Cables	2.24888994
	Cable 33kV - weight @ 3.65kg/m	Input value in meters (in conversion to tonnes cell)	0	0	3.81	0.032	0.0386	0	0	0	0		0
	Cable 6.6 / 11kV 3 Phase - weight @ 13.65kg/m	Input value in meters (in conversion to tonnes cell)	200	2.73	3.81	0.16	0.03988	10.401	0.4368	0.1089	10.9469724		10.9469724
Switchgear	Multicore Cable - av weight @ 1.5kg/m	Input value in meters (in conversion to tonnes cell)	300	0.45	3.81	0.16	0.03988	1.7445	0.072	0.0179	1.804446	Transformers	1.804446
	Transformer 33kV	Input value in Tonnes (in conversion to tonnes cell)	0	0	0	0	0	0	0	0	0		0
	Transformer 132kV	Input value in Tonnes (in conversion to tonnes cell)	0	0	0	0	0	0	0	0	0		0
	Transformer EAT	Input value in Tonnes (in conversion to tonnes cell)	0	0	0	0	0	0	0	0	0		0
	11kV Switchgear @ 600kg per panel	Input value in Tonnes (in conversion to tonnes cell)	6	3.6	3.54	0.032	0.0359	12.744	0.1152	0.1292	12.98844		12.98844
	Switch Gear 2	Input value in Tonnes (in conversion to tonnes cell)	0	0	0	0	0	0	0	0	0		0
Switchgear	Switch Gear 3	Input value in Tonnes (in conversion to tonnes cell)	0	0	0	0	0	0	0	0	0	0	
	Switch Gear 4	Input value in Tonnes (in conversion to tonnes cell)	0	0	0	0	0	0	0	0	0	0	
	Switch Gear 5	Input value in Tonnes (in conversion to tonnes cell)	0	0	0	0	0	0	0	0	0	0	
	Switch Gear 6	Input value in Tonnes (in conversion to tonnes cell)	0	0	0	0	0	0	0	0	0	0	

Calculation Notes:	
Weight of structural Timber (Excluding temp works):	tonnes
Weight of Temporary Timber (formwork, Assumed reuse):	tonnes
Foundation - Trench Excavations	At Length [4.25] m x Width [4] m x Depth [1] m = [17] m3
Cables - Trench Excavations	At Length [200] m x Width [0.4] m x Depth [1] m = [80] m3
Power Cable circuit lengths	[28] meter lengths x No. of cables [7]

Key:	Designer to fill in all cells highlighted in light grey
Low	Medium
High	
0	12.5
	25
	37.5
	50

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.

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.

Reference note:	Calculations & Embodied Carbon factors for materials used in the table sourced from the Bria (ICE) & IStructE
Ref for material Embodied Carbon Factors:	A BSRIA guide: Hammond, G et al., 'Embodied Carbon', The Inventory of Carbon and Energy, (ICE).
Ref for calculating Embodied Carbon A1-5a Cell colour formatting:	Embodied Carbon - The Inventory of Carbon and Energy, (ICE) (https://www.icecarbonandenergy.org.uk/)
	The Institution of Structural Engineers 'How to calculate embodied carbon'.
	A brief guide to calculating embodied carbon. (https://www.istructe.org/)

Important note:	All materials calculated in above sheet, includes only imported materials
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 (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 (CO2e). Distances referenced from IStructE: Locally sourced within 50km = 0.005kg(CO2e) / Nationally Sourced within 320km = 0.32kg(CO2e) / 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 WF/(Material ECF x Distance Travelled x Distance travelled for waste material taken to landfill (C2) x CO2 used for processing disposal (C3-4) = A5w / Example, assumed waste of concrete is : 0.953 x (A1-3 x A4 x C2 x C3-4) = A5w : Sourced IStructE
5a	Typical assumed cost at stage A1-5 of build is 50% so: 700kg(CO2e) per £100,000 so: 0.7 x (cost of build + 100,000) = Ans (CO2e). Sourced IStructE

