

SANS 10400-XA House: 01 REFERENCE DESIGN

Item	Materials			Conversion				E ₁ : Carbon Footprint		E ₂ : Acidification Potential		E ₃ : Eutrophication Potential		E ₄ : Resource Depletion		E ₅ : Waste Generation						
	Ecoinvent Equivalent	Loc	Unit	Quantity	Mass [kg]	Ecoinvent unit	Conversion factor	New Value	[kg CO ₂ e/unit]	[kg CO ₂ e/item]	[kg SO ₂ e/unit]	[kg SO ₂ e/item]	[kg NO _x e/unit]	[kg NO _x e/item]	[MJ-eq/unit]	[MJ-eq/item]	Waste from Production	Construction Waste	[kg/unit]	[kg/item]	[m ³ /item]	[kg/item]
END-OF-LIFE PHASE																						
Foundations																						
10 MPa concrete foundation (600x200mm)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	7.32	17568.00	kg	2400.00	17568.00	0.0129	226.47	0.0001	1.90	0.00020334	3.57	0.3015	5296.36	1.0022	17606.65				
Reinforcing (4 x Y12)	treatment of waste reinforcement steel, collection for final disposal	CH	kg	68.95	68.95	kg	1.00	68.95	0.1512	10.42	0.0010	0.07	0.020793	1.43	2.1420	147.70	0.2136	14.73				
190 mm solid blockwork (foundation wall)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	16.00	4560.00	kg	285.00	4560.00	0.0129	58.78	0.0001	0.49	0.0002	0.93	0.3015	1374.74	1.0022	4570.03				
400x210mm strip footing	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	3.36	7392.00	kg	2200.00	7392.00	0.0129	95.29	0.0001	0.80	0.0002	1.50	0.3015	2228.52	1.0022	7408.26				
brickforce (75x2.8mm)	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m	80.00	8.72	kg	0.11	8.72	0.0018	0.02	0.0000	0.00	0.0000	0.00	0.0281	0.24	0.0001	0.00				
Floor Slab																						
Damp proof membrane 250 micron	treatment of waste polyethylene/polypropylene product, collection for final disposal	RoW	m ²	91.00	20.93	kg	0.23	20.93	0.3839	8.03	0.0001	0.00	0.0040	0.08	0.3704	7.75	0.9129	19.11				
25 MPa concrete (power floated)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	9.10	21840.00	kg	2400.00	21840.00	0.0129	281.54	0.0001	2.36	0.0002	4.44	0.3015	6584.28	1.0022	21888.05				
steel mesh ref 193	treatment of waste reinforcement steel, collection for final disposal	CH	m ²	91.00	175.63	kg	1.93	175.63	0.1512	26.55	0.0010	0.17	0.0208	3.65	2.1420	376.19	0.2136	37.51				
External walls 140 mm																						
Two top courses of brickwork to be filled with 10 Mpa concrete	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	1.02	2454.11	kg	2400.00	2454.11	0.0129	31.64	0.0001	0.26	0.0002	0.50	0.3015	739.86	1.0022	2459.51				
Blockwork, mortar (140mm)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ²	89.80	14367.75	kg	160.00	14367.75	0.0129	185.21	0.0001	1.55	0.0002	2.92	0.3015	4331.56	1.0022	14399.36				
brickforce as NHBRC standard	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m	240.00	26.15	kg	0.11	26.15	0.0018	0.05	0.0000	0.00	0.0000	0.00	0.0281	0.73	0.0001	0.00				
Plaster externally (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	89.80	2478.44	kg	27.60	2478.44	0.0087	21.63	0.0001	0.17	0.0001	0.33	0.2363	585.75	1.0022	2483.89				
Plaster internally (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	89.80	2478.44	kg	27.60	2478.44	0.0087	21.63	0.0001	0.17	0.0001	0.33	0.2363	585.75	1.0022	2483.89				
DPC - 375micron	treatment of waste polyethylene/polypropylene product, collection for final disposal	RoW	m	40.00	1.52	kg	0.04	1.52	0.3839	0.58	0.0001	0.00	0.0040	0.01	0.3704	0.56	0.9129	1.39				
Internal Walls 90 mm																						
Solid blockwork, mortar	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ²	69.57	12869.85	kg	185.00	12869.85	0.0129	165.91	0.0001	1.39	0.0002	2.62	0.3015	3879.97	1.0022	12898.16				
Plaster, both sides (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	139.13	3840.08	kg	27.60	3840.08	0.0087	33.51	0.0001	0.26	0.0001	0.51	0.2363	907.56	1.0022	3848.53				
Ceiling and Thermal Insulation																						
6.4 mm gypsum plaster board	treatment of waste gypsum, sanitary landfill	CH	m ²	91.00	518.70	kg	5.70	518.70	0.0122	6.34	0.0249	12.93	0.0002	0.12	0.3342	173.37	1.0037	520.62				
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornices)	treatment of waste mineral wool, inert material landfill	RoW	m ²	91.00	527.80	kg	5.80	527.80	0.005503	2.90	4.74E-05	0.03	8.70E-05	0.05	0.18291267	96.54	0.99965	527.62				
Roofing																						
Howe type truss to be designed by supplier for 7 m span	treatment of waste wood, untreated, municipal incineration	RoW	m ³	1.22	609.68	kg	500.00	609.68	0.0146	8.90	0.0002	0.10	0.0006	0.36	0.1663	101.40	0.0120	7.29				
114x38 wall plate including beam filling	treatment of waste wood, untreated, municipal incineration	RoW	m ³	0.11	56.32	kg	500.00	56.32	0.0146	0.82	0.0002	0.01	0.0006	0.03	0.1663	9.37	0.0120	0.67				
50x76 mm purlins on edge at maximum 1.2 m spacing	treatment of waste wood, untreated, municipal incineration	RoW	m ³	0.40	197.60	kg	500.00	197.60	0.0146	2.89	0.0002	0.03	0.0006	0.12	0.1663	32.86	0.0120	2.36				
Roof Covering																						
0.54 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive "Zincalume" based steel sheeting	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m ²	100.87	507.37	kg	5.03	507.37	0.0018	0.94	0.0000	0.01	0.0000	0.02	0.0281	14.23	0.0001	0.03				
Ridge cappings 450 mm girth	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m	13.00	29.43	kg	2.26	29.43	0.0018	0.05	0.0000	0.00	0.0000	0.00	0.0281	0.83	0.0001	0.00				
Additional Transport - to landfill (10km)	transport, freight, lorry 3.5-7.5 metric ton, EURO3	RoW	tkm	925.97	92597.45	tkm	1.00	925.97	0.53068	491.40	0.0030851	2.86	0.0062793	5.81	8.694566	8050.95	0.22901	212.06				
Sub-Totals																		91389.70				
END-OF-LIFE PHASE IMPACT										1681.49	25.55	29.33	35527.08	91389.70								
TOTAL LIFE CYCLE IMPACT										231066.56	2256.28	6190.67	3116428.64	114847.37								

D2. EXTERNAL WALLING SYSTEM 02: SINGLE LEAF CLAY MASONRY

SANS 10400-XA House: 02 SINGLE LEAF BRICK (140mm)																	E1: Waste Generation				
Materials					Conversion				E1: Carbon Footprint		E1: Acidification Potential		E1: Eutrophication Potential		E1: Resource Depletion		Waste from Production		Construction Waste		
Item	Ecoinvent Equivalent	Loc	Unit	Quantity	Mass [kg]	Ecoinvent unit	Conversion factor	New Value	[kg CO ₂ e/unit]	[kg CO ₂ e/Item]	[kg SO ₂ e/unit]	[kg SO ₂ e/Item]	[kg NO _x e/unit]	[kg NO _x e/Item]	[MJ-eq/unit]	[MJ-eq/Item]	[kg/unit]	[kg/Item]	[m ³ /Item]	[kg/Item]	
PRE-USE PHASE																					
Foundations																					
10 MPa concrete foundation (600x200mm)	concrete production, normal	RoW	m ³	7.32	17568.00	m ³	1.00	7.32	370.4100	2711.40	1.0317	7.55	2.4093	17.64	2478.2760	18140.98	36.7870	269.28	0.22	527.04	
Reinforcing (4 x Y12)	reinforcing steel production; section bar rolling, steel	RoW	kg	68.95	68.95	kg	1.00	68.95	2.6337	181.61	0.0107	0.74	0.0494903	3.41	34.5065	2379.37	0.6712	46.28	0.00	3.45	
190 mm solid blockwork (foundation wall)	concrete block production	RoW	m ²	16.00	4560.00	kg	285.00	4560.00	0.1807	824.08	0.0006	2.73	0.0018	8.08	1.4632	6672.04	0.0278	126.64	0.35	384.38	
400x210mm strip footing	concrete block production	RoW	m ³	3.36	7392.00	kg	2200.00	7392.00	0.1807	1335.88	0.0006	4.43	0.0018	13.11	1.4632	10815.73	0.0278	205.28	0.52	1153.15	
brickforce (75x2.8mm)	steel production, low-alloyed, hot rolled; wire drawing, steel	RoW	m	80.00	8.72	kg	0.11	8.72	2.6463	23.07	0.0120	0.10	0.0677	0.59	39.2618	342.21	0.9042	7.88	0.00	0.00	
galvanised	zinc coating, coils	RoW	m ²	1.57		m ²	1.00	1.57	5.3066	8.32	0.30194	0.47	0.56793	0.89	106.39365	166.83	0.28081	0.44	0.00	0.00	
Floor Slab																					
Damp proof membrane 250 micron	polyethylene production, low density, granulate; extrusion production, plastic film	RoW	m ²	91.00	20.93	kg	0.23	20.93	2.7305	57.15	0.0120	0.25	0.0277	0.58	83.9319	1756.70	0.0817	1.71	0.00	0.00	
25 MPa concrete (power floated)	concrete production, normal	RoW	m ³	9.10	21840.00	m ³	1.00	9.10	370.4100	3370.73	1.0317	9.39	2.4093	21.92	2478.2760	22552.31	36.7870	334.76	0.27	655.20	
steel mesh ref 193	reinforcing steel production; section bar rolling, steel	RoW	m ²	91.00	175.63	kg	1.93	175.63	2.6337	462.56	0.0107	1.88	0.0495	8.69	34.5065	6060.38	0.6712	117.89	0.00	8.78	
External walls 140 mm																					
Blockwork, brick (140mm)	brick production	RoW	m ³	12.57	28915.09	kg	2300.00	28915.09	0.2534	7327.66	0.0010	28.64	0.0018	50.99	3.3842	97854.46	0.0093	269.58	1.96	4510.75	
brickforce as NHBC standard	steel production, low-alloyed, hot rolled; wire drawing, steel	RoW	m	240.00	26.15	kg	0.11	26.15	2.6463	69.20	0.0120	0.31	0.0677	1.77	39.2618	1026.62	0.9042	23.64	0.00	0.00	
galvanised	zinc coating, coils	RoW	m ²	4.70		m ²	1.00	4.70	5.3066	24.96	0.30194	1.42	0.56793	2.67	106.39365	500.48	0.28081	1.32	0.00	0.00	
Plaster externally (12mm thick)	4:1 ratio [silica sand production : cement production, Portland]	RoW	m ²	89.80	2478.44	kg	27.60	2478.44	0.2631	652.02	0.0007	1.83	0.0016	3.85	1.5682	3886.71	0.0072	17.72	0.03	74.35	
Plaster internally (12mm thick)	4:1 ratio [silica sand production : cement production, Portland]	RoW	m ²	89.80	2478.44	kg	27.60	2478.44	0.2631	652.02	0.0007	1.83	0.0016	3.85	1.5682	3886.71	0.0072	17.72	0.03	74.35	
DPC - 375micron	polyethylene production, low density, granulate; extrusion production, plastic film	RoW	m	40.00	1.52	kg	0.04	1.52	2.7305	4.14	0.0120	0.02	0.0277	0.04	83.9319	127.41	0.0817	0.12	0.00	0.00	
Internal Walls 90 mm																					
Solid blockwork, mortar	concrete block production	RoW	m ²	69.57	12869.85	kg	185.00	12869.85	0.1807	2325.84	0.0006	7.72	0.0018	22.82	1.4632	18830.74	0.0278	357.41	0.98	1074.39	
Plaster, both sides (12mm thick)	4:1 ratio [silica sand production : cement production, Portland]	RoW	m ²	139.13	3840.08	kg	27.60	3840.08	0.2631	1010.23	0.0007	2.84	0.0016	5.96	1.5682	6022.07	0.0072	27.46	0.05	115.20	
Ceiling and Thermal Insulation																					
6.4 mm gypsum plaster board	gypsum plasterboard production	RoW	m ²	91.00	518.70	kg	5.70	518.70	0.3901	202.35	0.0026	1.35	0.0065	3.36	5.1088	2649.95	0.0239	12.39	0.15	129.58	
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornice)	glass wool mat production	RoW	m ²	91.00	527.80	kg	5.80	527.80	2.717	1434.03	0.021513	11.35	0.064579	34.08	49.498325	26125.22	0.20576	108.60	0.00	0.00	
Roofing																					
Howe type truss to be designed by supplier for 7 m span	planing, beam, softwood, air dried	RoW	m ³	1.22	609.68	m ³	1.00	1.22	105.2800	128.37	0.6861	0.84	5.8563	7.14	1666.1729	2031.66	39.9590	48.72	0.00	0.00	
114x38 wall plate including beam filling	planing, beam, softwood, air dried	RoW	m ³	0.11	56.32	m ³	1.00	0.11	105.2800	11.86	0.6861	0.08	5.8563	0.66	1666.1729	187.66	39.9590	4.50	0.00	0.00	
50x76 mm purlins on edge at maximum 1.2 m spacing	planing, beam, softwood, air dried	RoW	m ³	0.40	197.60	m ³	1.00	0.40	105.2800	41.61	0.6861	0.27	5.8563	2.31	1666.1729	658.47	39.9590	15.79	0.00	0.00	
Roof Covering																					
0.34 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive	steel production, low-alloyed, hot rolled; sheet rolling, steel	RoW	m ²	100.87	507.37	kg	5.03	507.37	2.5994	1318.85	0.0127	6.42	0.0681	34.57	39.9104	20249.26	0.8821	447.57	0.00	47.04	
Zincalume based steel sheeting	zinc coating, coils	RoW	m ²	100.87		m ²	1.00	100.87	5.3066	535.27	0.30194	30.46	0.56793	57.29	106.3937	10731.77	0.2808	28.32	0.00	0.00	
Ridge cappings 450 mm girth	steel production, low-alloyed, hot rolled; sheet rolling, steel	RoW	m	13.00	29.43	kg	2.26	29.43	2.5994	76.49	0.0127	0.37	0.0681	2.01	39.9104	1174.38	0.8821	25.96	0.00	0.00	
galvanised	zinc coating, coils	RoW	m ²	5.85		m ²	1.00	5.85	5.3066	31.04	0.30194	1.77	0.56793	3.32	106.3937	622.40	0.2808	1.64	0.00	0.00	
Additional Transport - from factory (100km)																					
Additional Transport - to landfill (10km)	transport, freight, lorry 3.5-7.5 metric ton, EURO3	RoW	tkm	10469.07	104690.68	tkm	1.00	10469.07	0.53068	5555.73	0.0030851	32.30	0.0062793	65.74	8.694566	91024.01	0.22901	2397.52			
Sub-Totals	transport, freight, lorry 3.5-7.5 metric ton, EURO3	RoW	tkm	87.58		tkm	1.00	87.58	0.53068	46.48	0.0030851	0.27	0.0062793	0.55	8.694566	761.44	0.22901	20.06		8757.68	
PRE-USE PHASE IMPACT																					
										30422.93		157.64		377.91		357237.96					13693.90

SANS 10400-XA House: 02 SINGLE LEAF BRICK (140mm)																	E ₂ : Waste Generation			
Materials					Conversion			E ₁ : Carbon Footprint		E ₁ : Acidification Potential		E ₁ : Eutrophication Potential		E ₁ : Resource Depletion		Waste from Production		Construction Waste		
Item	Ecoinvent Equivalent	Loc	Unit	Quantity	Mass [kg]	Ecoinvent unit	Conversion factor	New Value	[kg CO ₂ /unit]	[kg CO _{2e} /item]	[kg SO ₂ /unit]	[kg SO _{2e} /item]	[kg NO _x /unit]	[kg NO _x /item]	[MJ-eq/unit]	[MJ-eq/item]	[kg/unit]	[kg/item]	[m ² /item]	[kg/item]
USE PHASE																				
REPLACEMENT OF PARTS																				
External walls 140 mm																				
Plaster externally (12mm thick)	4:1 ratio [silica sand production : cement production, Portland]	RoW	m ²	89.80	2478.44	kg	27.60	2478.44	0.2631	652.02	0.0007	1.83	0.0016	3.85	1.5682	3886.71	0.0072	17.72	0.03	74.35
Plaster internally (12mm thick)	4:1 ratio [silica sand production : cement production, Portland]	RoW	m ²	89.80	2478.44	kg	27.60	2478.44	0.2631	652.02	0.0007	1.83	0.0016	3.85	1.5682	3886.71	0.0072	17.72	0.03	74.35
Internal Walls 90 mm																				
Plaster, both sides (12mm thick)	4:1 ratio [silica sand production : cement production, Portland]	RoW	m ²	139.13	3840.08	kg	27.60	3840.08	0.2631	1010.23	0.0007	2.84	0.0016	5.96	1.5682	6022.07	0.0072	27.46	0.05	115.20
Ceiling and Thermal Insulation																				
6.4 mm gypsum plaster board	gypsum plasterboard production	RoW	m ²	91.00	518.70	kg	5.70	518.70	0.3901	202.35	0.0026	1.35	0.0065	3.36	5.1088	2649.95	0.0239	12.39	0.15	129.58
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornices)	glass wool mat production	RoW	m ²	91.00	527.80	kg	5.80	527.80	2.717	1434.03	0.02153	11.35	0.064579	34.08	49.498325	26125.22	0.20576	108.60	0.00	0.00
Roof Covering																				
0.54 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive	steel production, low-alloyed, hot rolled; sheet rolling, steel	RoW	m ²	100.87	507.37	kg	5.03	507.37	2.5994	1318.85	0.0127	6.42	0.0681	34.57	39.9104	20249.26	0.8821	447.57	0.00	47.04
"Zincalume" based steel sheeting	zinc coating, coils	RoW	m ²	100.87		m ²	1.00	100.87	5.3066	535.27	0.30194	30.46	0.56793	57.29	106.3937	10731.77	0.2808	28.32	0.00	0.00
Ridge cappings 450 mm girth	steel production, low-alloyed, hot rolled; sheet rolling, steel	RoW	m	13.00	29.43	kg	2.26	29.43	2.5994	76.49	0.0127	0.37	0.0681	2.01	39.9104	1174.38	0.8821	25.96	0.00	0.00
galvanised	zinc coating, coils	RoW	m ²	5.85		m ²	1.00	5.85	5.3066	31.04	0.30194	1.77	0.56793	3.32	106.3937	622.40	0.2808	1.64	0.00	0.00
Additional Transport - from factory (100km)																				
transport, freight, lorry 3.5-7.5 metric ton, EURO3		RoW	tkm	1038.03	10380.25	tkm	1.00	1038.03	0.53068	550.86	0.0030851	3.20	0.0062793	6.52	8.694566	9025.18	0.22901	237.72		
Additional Transport - to landfill (10km)																				
transport, freight, lorry 3.5-7.5 metric ton, EURO3		RoW	tkm	4.41		tkm	1.00	4.41	0.53068	2.34	0.0030851	0.01	0.0062793	0.03	8.694566	38.30	0.22901	1.01		
DISPOSAL OF OLD PARTS																				
External walls 140 mm																				
Plaster externally (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	89.80	2478.44	kg	27.60	2478.44	0.0087	21.63	0.0001	0.17	0.0001	0.33	0.2363	585.75	1.0022	2483.89		
Plaster internally (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	89.80	2478.44	kg	27.60	2478.44	0.0087	21.63	0.0001	0.17	0.0001	0.33	0.2363	585.75	1.0022	2483.89		
Internal Walls 90 mm																				
Plaster, both sides (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	139.13	3840.08	kg	27.60	3840.08	0.0087	33.51	0.0001	0.26	0.0001	0.51	0.2363	907.56	1.0022	3848.53		
Ceiling and Thermal Insulation																				
6.4 mm gypsum plaster board	treatment of waste gypsum, sanitary landfill	CH	m ²	91.00	518.70	kg	5.70	518.70	0.0122	6.34	0.0249	12.93	0.0002	0.12	0.3342	173.37	1.0037	520.62		
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornices)	treatment of waste mineral wool, inert material landfill	RoW	m ²	91.00	527.80	kg	5.80	527.80	0.0055	2.90	0.0000	0.03	0.0001	0.05	0.1829	96.54	0.9997	527.62		
Roof Covering																				
0.54 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive "Zincalume" based steel sheeting	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m ²	100.87	507.37	kg	5.03	507.37	0.0018	0.94	0.0000	0.01	0.0000	0.02	0.0281	14.23	0.0001	0.03		
Ridge cappings 450 mm girth	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m	100.87	228.32	kg	2.26	228.32	0.0018	0.42	0.0000	0.00	0.0000	0.01	0.0281	6.40	0.0001	0.01		
Additional Transport - to landfill (10km)																				
transport, freight, lorry 3.5-7.5 metric ton, EURO3		RoW	tkm	105.79	10579.14	tkm	1.00	105.79	0.53068	56.14	0.0030851	0.33	0.0062793	0.66	8.694566	919.81	0.22901	24.23		
Sub-Totals: Materials																				
Number of maintenance cycles: 1																				
Use Phase: Maintenance Impact																				
Electricity for Heating/Cooling	electricity production, hard coal	ZA	kWh/a	5282.41		kWh	1.00	5282.414839	1.1186	5908.91	0.011452	60.49	0.032065	169.38	15.4220204	81465.51	0.0051195	27.04		
Use Phase: Operation Impact																				
Design working life (years): 30																				
USE PHASE IMPACT																				
										183876.26		1890.16		5238.28		2531666.66				12066.75

SANS 10400-XA House: 02 SINGLE LEAF BRICK (140mm)																	E ₂ : Waste Generation			
Materials					Conversion			E ₁ : Carbon Footprint		E ₂ : Acidification Potential		E ₃ : Eutrophication Potential		E ₄ : Resource Depletion		Waste from Production		Construction Waste		
Item	Ecoinvent Equivalent	Loc	Unit	Quantity	Mass [kg]	Ecoinvent unit	Conversion factor	New Value	[kg CO ₂ e/unit]	[kg CO ₂ e/Item]	[kg SO ₂ e/unit]	[kg SO ₂ e/Item]	[kg NO ₃ e/unit]	[kg NO ₃ e/Item]	[MJ-eq/unit]	[MJ-eq/Item]	[kg/unit]	[kg/Item]	[m ³ /Item]	[kg/Item]
END-OF-LIFE PHASE																				
Foundations																				
10 MPa concrete foundation (600x200mm)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	7.32	17568.00	kg	2400.00	17568.00	0.0129	226.47	0.0001	1.90	0.00020334	3.57	0.3015	5296.36	1.0022	17606.65		
Reinforcing (4 x Y12)	treatment of waste reinforcement steel, collection for final disposal	CH	kg	68.95	68.95	kg	1.00	68.95	0.1512	10.42	0.0010	0.07	0.020793	1.43	2.1420	147.70	0.2136	14.73		
190 mm solid blockwork (foundation wall)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ²	16.00	4560.00	kg	285.00	4560.00	0.0129	58.78	0.0001	0.49	0.0002	0.93	0.3015	1374.74	1.0022	4570.03		
400x210mm strip footing	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	3.36	7392.00	kg	2200.00	7392.00	0.0129	95.29	0.0001	0.80	0.0002	1.50	0.3015	2228.52	1.0022	7408.26		
brickforce (75x2.8mm)	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m	80.00	8.72	kg	0.11	8.72	0.0018	0.02	0.0000	0.00	0.0000	0.00	0.0281	0.24	0.0001	0.00		
Floor Slab																				
Damp proof membrane 250 micron	treatment of waste polyethylene/polypropylene product, collection for final disposal	RoW	m ²	91.00	20.93	kg	0.23	20.93	0.3839	8.03	0.0001	0.00	0.0040	0.08	0.3704	7.75	0.9129	19.11		
25 MPa concrete (power floated)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	9.10	21840.00	kg	2400.00	21840.00	0.0129	281.54	0.0001	2.36	0.0002	4.44	0.3015	6584.28	1.0022	21888.05		
steel mesh ref 193	treatment of waste reinforcement steel, collection for final disposal	CH	m ²	91.00	175.63	kg	1.93	175.63	0.1512	26.55	0.0010	0.17	0.0208	3.65	2.1420	376.19	0.2136	37.51		
External walls 140 mm																				
Blockwork, brick (140mm)	treatment of waste brick, collection for final disposal	CH	m ³	12.57	28915.09	kg	2300.00	28915.09	0.0121	351.26	0.0001	2.92	0.0002	5.51	0.2898	8381.03	1.0022	28978.71		
brickforce as NHBRC standard	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m	240.00	26.15	kg	0.11	26.15	0.0018	0.05	0.0000	0.00	0.0000	0.00	0.0281	0.73	0.0001	0.00		
Plaster externally (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	89.80	2478.44	kg	27.60	2478.44	0.0087	21.63	0.0001	0.17	0.0001	0.33	0.2363	585.75	1.0022	2483.89		
Plaster internally (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	89.80	2478.44	kg	27.60	2478.44	0.0087	21.63	0.0001	0.17	0.0001	0.33	0.2363	585.75	1.0022	2483.89		
DPC - 375micron	treatment of waste polyethylene/polypropylene product, collection for final disposal	RoW	m	40.00	1.52	kg	0.04	1.52	0.3839	0.58	0.0001	0.00	0.0040	0.01	0.3704	0.56	0.9129	1.39		
Internal Walls 90 mm																				
Solid blockwork, mortar	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ²	69.57	12869.85	kg	185.00	12869.85	0.0129	165.91	0.0001	1.39	0.0002	2.62	0.3015	3879.97	1.0022	12898.16		
Plaster, both sides (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	139.13	3840.08	kg	27.60	3840.08	0.0087	33.51	0.0001	0.26	0.0001	0.51	0.2363	907.56	1.0022	3848.53		
Ceiling and Thermal Insulation																				
6.4 mm gypsum plaster board	treatment of waste gypsum, sanitary landfill	CH	m ²	91.00	518.70	kg	5.70	518.70	0.0122	6.34	0.0249	12.93	0.0002	0.12	0.3342	173.37	1.0037	520.62		
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornices)	treatment of waste mineral wool, inert material landfill	RoW	m ²	91.00	527.80	kg	5.80	527.80	0.005503	2.90	4.74E-05	0.03	8.70E-05	0.05	0.18291267	96.54	0.99965	527.62		
Roofing																				
Howe type truss to be designed by supplier for 7 m span	treatment of waste wood, untreated, municipal incineration	RoW	m ³	1.22	609.68	kg	500.00	609.68	0.0146	8.90	0.0002	0.10	0.0006	0.36	0.1663	101.40	0.0120	7.29		
114x38 wall plate including beam filling	treatment of waste wood, untreated, municipal incineration	RoW	m ³	0.11	56.32	kg	500.00	56.32	0.0146	0.82	0.0002	0.01	0.0006	0.03	0.1663	9.37	0.0120	0.67		
50x76 mm purlins on edge at maximum 1.2 m spacing	treatment of waste wood, untreated, municipal incineration	RoW	m ³	0.40	197.60	kg	500.00	197.60	0.0146	2.89	0.0002	0.03	0.0006	0.12	0.1663	32.86	0.0120	2.36		
Roof Covering																				
0.54 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive "Zincalume" based steel sheeting	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m ²	100.87	507.37	kg	5.03	507.37	0.0018	0.94	0.0000	0.01	0.0000	0.02	0.0281	14.23	0.0001	0.03		
Ridge cappings 450 mm girth	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m	13.00	29.43	kg	2.26	29.43	0.0018	0.05	0.0000	0.00	0.0000	0.00	0.0281	0.83	0.0001	0.00		
Additional Transport - to landfill (10km)																				
transport, freight, lorry 3.5-7.5 metric ton, EURO3		RoW	tkm	1046.91	104690.68	tkm	1.00	1046.91	0.53068	555.57	0.0030851	3.23	0.0062793	6.57	8.694566	9102.40	0.22901	239.75		
Sub-Totals																				
END-OF-LIFE PHASE IMPACT										1880.08	27.02	32.18	39888.15	103537.24	103537.24					
TOTAL LIFE CYCLE IMPACT										216179.28	2074.83	5648.37	2928792.77	129297.88	129297.88					

D3. EXTERNAL WALLING SYSTEM 03: DOUBLE LEAF BRICK CAVITY WALL

SANS 10400-XA House: 03 DOUBLE LEAF BRICK (2x90mm)																		E ₂ : Waste Generation			
Materials						Conversion			E ₁ : Carbon Footprint		E ₁ : Acidification Potential		E ₁ : Eutrophication Potential		E ₁ : Resource Depletion		Waste from Production		Construction Waste		
Item	Equivalent	Loc	Unit	Quantity	Mass [kg]	Ecoinvent unit	Conversion factor	New Value	[kg CO ₂ e/unit]	[kg CO ₂ e/item]	[kg SO ₂ e/unit]	[kg SO ₂ e/item]	[kg NO _x /unit]	[kg NO _x /item]	[MJ-eq/unit]	[MJ-eq/item]	[kg/unit]	[kg/item]	[m ³ /item]	[kg/item]	
PRE-USE PHASE																					
Foundations																					
10 MPa concrete foundation (600x200mm)	concrete production, normal																				
	Reinforcing (4 x Y12)	RoW	m ³	7.32	17568.00	m ³	1.00	7.32	370.4100	2711.40	1.0317	7.55	2.4093	17.64	2478.2760	18140.98	36.7870	269.28	0.22	527.04	
	190 mm solid blockwork (foundation wall)	RoW	m ²	16.00	4560.00	kg	285.00	4560.00	0.1807	824.08	0.0006	2.73	0.0018	8.08	1.4632	6672.04	0.0278	126.64	0.35	384.38	
	400x210mm strip footing	RoW	m ³	3.36	7392.00	kg	2200.00	7392.00	0.1807	1335.88	0.0006	4.43	0.0018	13.11	1.4632	10815.73	0.0278	205.28	0.52	1153.15	
	brickforce (75x2.8mm)	RoW	m	80.00	8.72	kg	0.11	8.72	2.6463	23.07	0.0120	0.10	0.0677	0.59	39.2618	342.21	0.9042	7.88	0.00	0.00	
	galvanised	RoW	m ²	1.57		m ²	1.00	1.57	5.3066	8.32	0.30194	0.47	0.56793	0.89	106.39365	166.83	0.28081	0.44	0.00	0.00	
Floor Slab																					
	Damp proof membrane 250 micron	RoW	m ²	91.00	20.93	kg	0.23	20.93	2.7305	57.15	0.0120	0.25	0.0277	0.58	83.9319	1756.70	0.0817	1.71	0.00	0.00	
	25 MPa concrete (power floated)	RoW	m ³	9.10	21840.00	m ³	1.00	9.10	370.4100	3370.73	1.0317	9.39	2.4093	21.92	2478.2760	22552.31	36.7870	334.76	0.27	655.20	
	steel mesh ref 193	RoW	m ²	91.00	175.63	kg	1.93	175.63	2.6337	462.56	0.0107	1.88	0.0495	8.69	34.5065	6060.38	0.6712	117.89	0.00	8.78	
External walls 2 x 90 mm																					
	Blockwork, brick (2x90mm)	RoW	m ³	16.16	37176.55	kg	2300.00	37176.55	0.2534	9421.28	0.0010	36.82	0.0018	65.56	3.3842	125812.87	0.0093	346.60	2.52	5799.54	
	brickforce as NHBRC standard	RoW	m	240.00	26.15	kg	0.11	26.15	2.6463	69.20	0.0120	0.31	0.0677	1.77	39.2618	1026.62	0.9042	23.64	0.00	0.00	
	galvanised	RoW	m ²	4.70		m ²	1.00	4.70	5.3066	24.96	0.30194	1.42	0.56793	2.67	106.39365	500.48	0.28081	1.32	0.00	0.00	
	Plaster externally (12mm thick)	RoW	m ²	89.80	2478.44	kg	27.60	2478.44	0.2631	652.02	0.0007	1.83	0.0016	3.85	1.5682	3886.71	0.0072	17.72	0.03	74.35	
	Plaster internally (12mm thick)	RoW	m ²	89.80	2478.44	kg	27.60	2478.44	0.2631	652.02	0.0007	1.83	0.0016	3.85	1.5682	3886.71	0.0072	17.72	0.03	74.35	
	DPC - 375micron	RoW	m	40.00	1.52	kg	0.04	1.52	2.7305	4.14	0.0120	0.02	0.0277	0.04	83.9319	127.41	0.0817	0.12	0.00	0.00	
Internal Walls 90 mm																					
	Solid blockwork, mortar	RoW	m ²	69.57	12869.85	kg	185.00	12869.85	0.1807	2325.84	0.0006	7.72	0.0018	22.82	1.4632	18830.74	0.0278	357.41	0.98	1074.39	
	Plaster, both sides (12mm thick)	RoW	m ²	139.13	3840.08	kg	27.60	3840.08	0.2631	1010.23	0.0007	2.84	0.0016	5.96	1.5682	6022.07	0.0072	27.46	0.05	115.20	
Ceiling and Thermal Insulation																					
	6.4 mm gypsum plaster board	RoW	m ²	91.00	518.70	kg	5.70	518.70	0.3901	202.35	0.0026	1.35	0.0065	3.36	5.1088	2649.95	0.0239	12.39	0.15	129.58	
	145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornices)	RoW	m ³	91.00	527.80	kg	5.80	527.80	2.717	1434.03	0.021513	11.35	0.064579	34.08	49.498325	26125.22	0.20576	108.60	0.00	0.00	
Roofing																					
	Howe type truss to be designed by supplier for 7 m span	RoW	m ³	1.22	609.68	m ³	1.00	1.22	105.2800	128.37	0.6861	0.84	5.8563	7.14	1666.1729	2031.66	39.9590	48.72	0.00	0.00	
	114x38 wall plate including beam filling	RoW	m ³	0.11	56.32	m ³	1.00	0.11	105.2800	11.86	0.6861	0.08	5.8563	0.66	1666.1729	187.66	39.9590	4.50	0.00	0.00	
	50x76 mm purlins on edge at maximum 1.2 m spacing	RoW	m ³	0.40	197.60	m ³	1.00	0.40	105.2800	41.61	0.6861	0.27	5.8563	2.31	1666.1729	658.47	39.9590	15.79	0.00	0.00	
Roof Covering																					
	0.54 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive	RoW	m ²	100.87	507.37	kg	5.03	507.37	2.5994	1318.85	0.0127	6.42	0.0681	34.57	39.9104	20249.26	0.8821	447.57	0.00	47.04	
	"Zincalume" based steel sheeting	RoW	m ²	100.87		m ²	1.00	100.87	5.3066	535.27	0.30194	30.46	0.56793	57.29	106.3937	10731.77	0.2808	28.32	0.00	0.00	
	Ridge cappings 450 mm girth	RoW	m	13.00	29.43	kg	2.26	29.43	2.5994	76.49	0.0127	0.37	0.0681	2.01	39.9104	1174.38	0.8821	25.96	0.00	0.00	
	galvanised	RoW	m ²	5.85		m ²	1.00	5.85	5.3066	31.04	0.30194	1.77	0.56793	3.32	106.3937	622.40	0.2808	1.64	0.00	0.00	
	Additional Transport - from factory (100km)	RoW	tkm	11295.21	112952.14	tkm	1.00	11295.21	0.53068	5994.14	0.0030851	34.85	0.0062793	70.93	8.694566	98206.98	0.22901	2586.72			
	Additional Transport - to landfill (10km)	RoW	tkm	100.46		tkm	1.00	100.46	0.53068	53.31	0.0030851	0.31	0.0062793	0.63	8.694566	873.50	0.22901	23.01			
	Sub-Totals																			10046.47	
PRE-USE PHASE IMPACT										32961.81		168.41		397.74		392491.40				5205.38	15251.85

SANS 10400-XA House: 03 DOUBLE LEAF BRICK (2x90mm)																E ₂ : Waste Generation				
Materials				Conversion				E ₁ : Carbon Footprint		E ₁ : Acidification Potential		E ₁ : Eutrophication Potential		E ₂ : Resource Depletion		Waste from Production		Construction Waste		
Item	Ecoinvent Equivalent	Loc	Unit	Quantity	Mass [kg]	Ecoinvent unit	Conversion factor	New Value	[kg CO ₂ e/unit]	[kg CO ₂ e/item]	[kg SO ₂ e/unit]	[kg SO ₂ e/item]	[kg NO ₃ e/unit]	[kg NO ₃ e/item]	[MJ-eq/unit]	[MJ-eq/item]	[kg/unit]	[kg/item]	[m ² /item]	[kg/item]
USE PHASE																				
REPLACEMENT OF PARTS																				
External walls 2 x 90 mm																				
Plaster externally (12mm thick)	4:1 ratio [silica sand production : cement production, Portland]	RoW	m ²	89.80	2478.44	kg	27.60	2478.44	0.2631	652.02	0.0007	1.83	0.0016	3.85	1.5682	3886.71	0.0072	17.72	0.03	74.35
Plaster internally (12mm thick)	4:1 ratio [silica sand production : cement production, Portland]	RoW	m ²	89.80	2478.44	kg	27.60	2478.44	0.2631	652.02	0.0007	1.83	0.0016	3.85	1.5682	3886.71	0.0072	17.72	0.03	74.35
Internal Walls 90 mm																				
Plaster, both sides (12mm thick)	4:1 ratio [silica sand production : cement production, Portland]	RoW	m ²	139.13	3840.08	kg	27.60	3840.08	0.2631	1010.23	0.0007	2.84	0.0016	5.96	1.5682	6022.07	0.0072	27.46	0.05	115.20
Ceiling and Thermal Insulation																				
6.4 mm gypsum plaster board	gypsum plasterboard production	RoW	m ²	91.00	518.70	kg	5.70	518.70	0.3901	202.35	0.0026	1.35	0.0065	3.36	5.1088	2649.95	0.0230	12.39	0.15	129.58
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornices)	glass wool mat production	RoW	m ²	91.00	527.80	kg	5.80	527.80	2.717	1434.03	0.021513	11.35	0.064579	34.08	49.498325	26125.22	0.20576	108.60	0.00	0.00
Roof Covering																				
0.54 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive	steel production, low-alloyed, hot rolled; sheet rolling, steel	RoW	m ²	100.87	507.37	kg	5.03	507.37	2.5994	1318.85	0.0127	6.42	0.0681	34.57	39.9104	20249.26	0.8821	447.57	0.00	47.04
"Zincalume" based steel sheeting	zinc coating, coils	RoW	m ²	100.87		m ²	1.00	100.87	5.3066	535.27	0.30194	30.46	0.56793	57.29	106.3937	10731.77	0.2808	28.32	0.00	0.00
Ridge cappings 450 mm girth	steel production, low-alloyed, hot rolled; sheet rolling, steel	RoW	m	13.00	29.43	kg	2.26	29.43	2.5994	76.49	0.0127	0.37	0.0681	2.01	39.9104	1174.38	0.8821	25.96	0.00	0.00
galvanised	zinc coating, coils	RoW	m ²	5.85		m ²	1.00	5.85	5.3066	31.04	0.30194	1.77	0.56793	3.32	106.3937	622.40	0.2808	1.64	0.00	0.00
Additional Transport - from factory (100km)																				
transport, freight, lorry 3.5-7.5 metric ton, EURO3		RoW	tkm	1038.03	10380.25	tkm	1.00	1038.03	0.53068	550.86	0.0030851	3.20	0.0062793	6.52	8.694566	9025.18	0.22901	237.72		
Additional Transport - to landfill (10km)																				
transport, freight, lorry 3.5-7.5 metric ton, EURO3		RoW	tkm	4.41		tkm	1.00	4.41	0.53068	2.34	0.0030851	0.01	0.0062793	0.03	8.694566	38.30	0.22901	1.01		
DISPOSAL OF OLD PARTS																				
External walls 2 x 90 mm																				
Plaster externally (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	89.80	2478.44	kg	27.60	2478.44	0.0087	21.63	0.0001	0.17	0.0001	0.33	0.2363	585.75	1.0022	2483.89		
Plaster internally (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	89.80	2478.44	kg	27.60	2478.44	0.0087	21.63	0.0001	0.17	0.0001	0.33	0.2363	585.75	1.0022	2483.89		
Internal Walls 90 mm																				
Plaster, both sides (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	139.13	3840.08	kg	27.60	3840.08	0.0087	33.51	0.0001	0.26	0.0001	0.51	0.2363	907.56	1.0022	3848.53		
Ceiling and Thermal Insulation																				
6.4 mm gypsum plaster board	treatment of waste gypsum, sanitary landfill	CH	m ²	91.00	518.70	kg	5.70	518.70	0.0122	6.34	0.0249	12.93	0.0002	0.12	0.3342	173.37	1.0037	520.62		
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornices)	treatment of waste mineral wool, inert material landfill	RoW	m ²	91.00	527.80	kg	5.80	527.80	0.0055	2.90	0.0000	0.03	0.0001	0.05	0.1829	96.54	0.9997	527.62		
Roof Covering																				
0.54 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive "Zincalume" based steel sheeting	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m ²	100.87	507.37	kg	5.03	507.37	0.0018	0.94	0.0000	0.01	0.0000	0.02	0.0281	14.23	0.0001	0.03		
Ridge cappings 450 mm girth	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m	100.87	228.32	kg	2.26	228.32	0.0018	0.42	0.0000	0.00	0.0000	0.01	0.0281	6.40	0.0001	0.01		
Additional Transport - to landfill (10km)																				
transport, freight, lorry 3.5-7.5 metric ton, EURO3		RoW	tkm	105.79	10579.14	tkm	1.00	105.79	0.53068	56.14	0.0030851	0.33	0.0062793	0.66	8.694566	919.81	0.22901	24.23		
Sub-Totals: Materials																				
Number of maintenance cycles: 1										6608.99	75.24	156.86	87701.38	10814.92	440.52					
Use Phase: Maintenance Impact																				
Electricity for Heating/Cooling	electricity production, hard coal	ZA	kWh/a	4371.43		kWh	1.00	4371.42778	1.1186	4889.88	0.011452	50.06	0.032065	140.17	15.4220204	67416.25	0.0051195	22.38		
Use Phase: Operation Impact																				
Design working life (years): 30										146696.37	1501.85	4205.09	2022487.45	671.39						
USE PHASE IMPACT																				
										153305.36	1577.18	4361.96	2110188.83	11926.83						

SANS 10400-XA House: 03 DOUBLE LEAF BRICK (2x90mm)																	E ₂ : Waste Generation				
Materials				Conversion				E ₁ : Carbon Footprint		E ₁ : Acidification Potential		E ₁ : Eutrophication Potential		E ₁ : Resource Depletion		Waste from Production		Construction Waste			
Item	Ecoinvent Equivalent	Loc	Unit	Quantity	Mass [kg]	Ecoinvent unit	Conversion factor	New Value	[kg CO ₂ e/unit]	[kg CO ₂ e/item]	[kg SO ₂ e/unit]	[kg SO ₂ e/item]	[kg NO _x /unit]	[kg NO _x /item]	[MJ-eq/unit]	[MJ-eq/item]	[kg/unit]	[kg/item]	[m ³ /item]	[kg/item]	
END-OF-LIFE PHASE																					
Foundations																					
10 MPa concrete foundation (600x200mm)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	7.32	17568.00	kg	2400.00	17568.00	0.0129	226.47	0.0001	1.90	0.00020334	3.57	0.3015	5296.36	1.0022	17606.65			
Reinforcing (4 x Y12)	treatment of waste reinforcement steel, collection for final disposal	CH	kg	68.95	68.95	kg	1.00	68.95	0.1512	10.42	0.0010	0.07	0.020793	1.43	2.1420	147.70	0.2136	14.73			
190 mm solid blockwork (foundation wall)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ²	16.00	4560.00	kg	285.00	4560.00	0.0129	58.78	0.0001	0.49	0.0002	0.93	0.3015	1374.74	1.0022	4570.03			
400x210mm strip footing	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	3.36	7392.00	kg	2200.00	7392.00	0.0129	95.29	0.0001	0.80	0.0002	1.50	0.3015	2228.52	1.0022	7408.26			
brickforce (75x2.8mm)	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m	80.00	8.72	kg	0.11	8.72	0.0018	0.02	0.0000	0.00	0.0000	0.00	0.0281	0.24	0.0001	0.00			
Floor Slab																					
Damp proof membrane 250 micron	treatment of waste polyethylene/polypropylene product, collection for final disposal	RoW	m ²	91.00	20.93	kg	0.23	20.93	0.3839	8.03	0.0001	0.00	0.0040	0.08	0.3704	7.75	0.9129	19.11			
25 MPa concrete (power floated)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	9.10	21840.00	kg	2400.00	21840.00	0.0129	281.54	0.0001	2.36	0.0002	4.44	0.3015	6584.28	1.0022	21888.05			
steel mesh ref 193	treatment of waste reinforcement steel, collection for final disposal	CH	m ²	91.00	175.63	kg	1.93	175.63	0.1512	26.55	0.0010	0.17	0.0208	3.65	2.1420	376.19	0.2136	37.51			
External walls 2 x 90 mm																					
Blockwork, brick (140mm)	treatment of waste brick, collection for final disposal	CH	m ³	16.16	37176.55	kg	2300.00	37176.55	0.0121	451.62	0.0001	3.75	0.0002	7.09	0.2898	10775.61	1.0022	37258.34			
brickforce as NHBC standard	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m	240.00	26.15	kg	0.11	26.15	0.0018	0.05	0.0000	0.00	0.0000	0.00	0.0281	0.73	0.0001	0.00			
Plaster externally (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	89.80	2478.44	kg	27.60	2478.44	0.0087	21.63	0.0001	0.17	0.0001	0.33	0.2363	585.75	1.0022	2483.89			
Plaster internally (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	89.80	2478.44	kg	27.60	2478.44	0.0087	21.63	0.0001	0.17	0.0001	0.33	0.2363	585.75	1.0022	2483.89			
DPC - 375micron	treatment of waste polyethylene/polypropylene product, collection for final disposal	RoW	m	40.00	1.52	kg	0.04	1.52	0.3839	0.58	0.0001	0.00	0.0040	0.01	0.3704	0.56	0.9129	1.39			
Internal Walls 90 mm																					
Solid blockwork, mortar	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ²	69.57	12869.85	kg	185.00	12869.85	0.0129	165.91	0.0001	1.39	0.0002	2.62	0.3015	3879.97	1.0022	12898.16			
Plaster, both sides (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	139.13	3840.08	kg	27.60	3840.08	0.0087	33.51	0.0001	0.26	0.0001	0.51	0.2363	907.56	1.0022	3848.53			
Ceiling and Thermal Insulation																					
6.4 mm gypsum plaster board	treatment of waste gypsum, sanitary landfill	CH	m ²	91.00	518.70	kg	5.70	518.70	0.0122	6.34	0.0249	12.93	0.0002	0.12	0.3342	173.37	1.0037	520.62			
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornice)	treatment of waste mineral wool, inert material landfill	RoW	m ²	91.00	527.80	kg	5.80	527.80	0.005503	2.90	4.74E-05	0.03	8.70E-05	0.05	0.18291267	96.54	0.99965	527.62			
Roofing																					
Howe type truss to be designed by supplier for 7 m span	treatment of waste wood, untreated, municipal incineration	RoW	m ³	1.22	609.68	kg	500.00	609.68	0.0146	8.90	0.0002	0.10	0.0006	0.36	0.1663	101.40	0.0120	7.29			
114x38 wall plate including beam filling	treatment of waste wood, untreated, municipal incineration	RoW	m ³	0.11	56.32	kg	500.00	56.32	0.0146	0.82	0.0002	0.01	0.0006	0.03	0.1663	9.37	0.0120	0.67			
50x76 mm purlins on edge at maximum 1.2 m spacing	treatment of waste wood, untreated, municipal incineration	RoW	m ³	0.40	197.60	kg	500.00	197.60	0.0146	2.89	0.0002	0.03	0.0006	0.12	0.1663	32.86	0.0120	2.36			
Roof Covering																					
0.54 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive "Zincalume" based steel sheeting	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m ²	100.87	507.37	kg	5.03	507.37	0.0018	0.94	0.0000	0.01	0.0000	0.02	0.0281	14.23	0.0001	0.03			
Ridge cappings 450 mm girth	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m	13.00	29.43	kg	2.26	29.43	0.0018	0.05	0.0000	0.00	0.0000	0.00	0.0281	0.83	0.0001	0.00			
Additional Transport - to landfill (10km)	transport, freight, lorry 3.5-7.5 metric ton, EURO3	RoW	tkm	1129.52	112952.14	tkm	1.00	1129.52	0.53068	599.41	0.0030851	3.48	0.0062793	7.09	8.694566	9820.70	0.22901	258.67			
Sub-Totals																		111835.79			
END-OF-LIFE PHASE IMPACT										2024.28	28.11	34.27	43001.03								
TOTAL LIFE CYCLE IMPACT										188291.45	1773.71	4793.97	2545681.26								

D4. EXTERNAL WALLING SYSTEM 04: CAST CONCRETE WALL

SANS 10400-XA House: 04 CAST CONCRETE (200mm)

Materials												Conversion				E1: Carbon Footprint		E2: Acidification Potential		E3: Eutrophication Potential		E4: Resource Depletion		E5: Waste Generation			
Item	EcoInvent Equivalent	Loc	Unit	Quantity	Mass [kg]	EcoInvent unit	Conversion factor	New Value	[kg CO ₂ /unit]	[kg CO _{2e} /Item]	[kg SO ₂ /unit]	[kg SO _{2e} /Item]	[kg NO _x /unit]	[kg NO _x /Item]	[MJ-eq/unit]	[MJ-eq/Item]	[kg/unit]	[kg/Item]	[m ³ /Item]	[kg/Item]							
PRE-USE PHASE																											
Foundations																											
10 MPa concrete foundation (600x200mm)	concrete production, normal	RoW	m ³	7.32	17568.00	m ³	1.00	7.32	370.4100	2711.40	1.0317	7.55	2.4093	17.64	2478.2760	18140.98	36.7870	269.28	0.22	527.04							
Reinforcing (4 x Y12)	reinforcing steel production; section bar rolling, steel	RoW	kg	68.95	68.95	kg	1.00	68.95	2.6337	181.61	0.0107	0.74	0.0494903	3.41	34.5065	2379.37	0.6712	46.28	0.00	3.45							
190 mm solid blockwork (foundation wall)	concrete block production	RoW	m ²	16.00	4560.00	kg	285.00 ¹	4560.00	0.1807	824.08	0.0006	2.73	0.0018	8.08	1.4632	6672.04	0.0278	126.64	0.35	384.38							
400x210mm strip footing	concrete block production	RoW	m ³	3.36	7392.00	kg	2200.00 ¹	7392.00	0.1807	1335.88	0.0006	4.43	0.0018	13.11	1.4632	10815.73	0.0278	205.28	0.52	1153.15							
brickforce (75x2.8mm)	steel production, low-alloyed, hot rolled; wire drawing, steel	RoW	m	80.00	8.72	kg	0.11 ²	8.72	2.6463	23.07	0.0120	0.10	0.0677	0.59	39.2618	342.21	0.9042	7.88	0.00	0.00							
galvanised	zinc coating, coils	RoW	m ²	1.57		m ²	1.00	1.57	5.3066	8.32	0.30194	0.47	0.56793	0.89	106.39365	166.83	0.28081	0.44	0.00	0.00							
Floor Slab																											
Damp proof membrane 250 micron	polyethylene production, low density, granulate; extrusion production, plastic film	RoW	m ²	91.00	20.93	kg	0.23 ³	20.93	2.7305	57.15	0.0120	0.25	0.0277	0.58	83.9319	1756.70	0.0817	1.71	0.00	0.00							
25 MPa concrete (power floated)	concrete production, normal	RoW	m ³	9.10	21840.00	m ³	1.00	9.10	370.4100	3370.73	1.0317	9.39	2.4093	21.92	2478.2760	22552.31	36.7870	334.76	0.27	655.20							
steel mesh ref 193	reinforcing steel production; section bar rolling, steel	RoW	m ²	91.00	175.63	kg	1.93 ⁴	175.63	2.6337	462.56	0.0107	1.88	0.0495	8.69	34.5065	6060.38	0.6712	117.89	0.00	8.78							
External walls 200 mm																											
Cast concrete (200mm)	concrete production, normal	RoW	m ³	17.96	43103.24	m ³	1.00	17.96	370.4100	6652.45	1.0317	18.53	2.4093	43.27	2478.2760	44509.06	36.7870	660.68	0.54	1293.10							
Plaster externally (12mm thick)	4:1 ratio [silica sand production : cement production, Portland]	RoW	m ²	89.80	2478.44	kg	27.60 ⁵	2478.44	0.2631	652.02	0.0007	1.83	0.0016	3.85	1.5682	3886.71	0.0072	17.72	0.03	74.35							
Plaster internally (12mm thick)	4:1 ratio [silica sand production : cement production, Portland]	RoW	m ²	89.80	2478.44	kg	27.60 ⁵	2478.44	0.2631	652.02	0.0007	1.83	0.0016	3.85	1.5682	3886.71	0.0072	17.72	0.03	74.35							
DPC - 375micron	polyethylene production, low density, granulate; extrusion production, plastic film	RoW	m	40.00	1.52	kg	0.04 ³	1.52	2.7305	4.14	0.0120	0.02	0.0277	0.04	83.9319	127.41	0.0817	0.12	0.00	0.00							
Internal Walls 90 mm																											
Solid blockwork, mortar	concrete block production	RoW	m ²	69.57	12869.85	kg	185.00 ¹	12869.85	0.1807	2325.84	0.0006	7.72	0.0018	22.82	1.4632	18830.74	0.0278	357.41	0.98	1074.39							
Plaster, both sides (12mm thick)	4:1 ratio [silica sand production : cement production, Portland]	RoW	m ²	139.13	3840.08	kg	27.60 ⁵	3840.08	0.2631	1010.23	0.0007	2.84	0.0016	5.96	1.5682	6022.07	0.0072	27.46	0.05	115.20							
Ceiling and Thermal Insulation																											
6.4 mm gypsum plaster board	gypsum plasterboard production	RoW	m ²	91.00	518.70	kg	5.70 ⁶	518.70	0.3901	202.35	0.0026	1.35	0.0065	3.36	5.1088	2649.95	0.0239	12.39	0.15	129.58							
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornice)	glass wool mat production	RoW	m ²	91.00	527.80	kg	5.80 ⁷	527.80	2.717	1434.03	0.021513	11.35	0.064579	34.08	49.498325	26125.22	0.20576	108.60	0.00	0.00							
Roofing																											
Howe type truss to be designed by supplier for 7 m span	planing, beam, softwood, air dried	RoW	m ³	1.22	609.68	m ³	1.00	1.22	105.2800	128.37	0.6861	0.84	5.8563	7.14	1666.1729	2031.66	39.9590	48.72	0.00	0.00							
114x38 wall plate including beam filling	planing, beam, softwood, air dried	RoW	m ³	0.11	56.32	m ³	1.00	0.11	105.2800	11.86	0.6861	0.08	5.8563	0.66	1666.1729	187.66	39.9590	4.50	0.00	0.00							
50x76 mm purlins on edge at maximum 1.2 m spacing	planing, beam, softwood, air dried	RoW	m ³	0.40	197.60	m ³	1.00	0.40	105.2800	41.61	0.6861	0.27	5.8563	2.31	1666.1729	658.47	39.9590	15.79	0.00	0.00							
Roof Covering																											
0.54 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive	steel production, low-alloyed, hot rolled; sheet rolling, steel	RoW	m ²	100.87	507.37	kg	5.03 ⁸	507.37	2.5994	1318.85	0.0127	6.42	0.0681	34.57	39.9104	20249.26	0.8821	447.57	0.00	47.04							
"Zincalume" based steel sheeting	zinc coating, coils	RoW	m ²	100.87		m ²	1.00	100.87	5.3066	535.27	0.30194	30.46	0.56793	57.29	106.3937	10731.77	0.2808	28.32	0.00	0.00							
Ridge cappings 450 mm girth	steel production, low-alloyed, hot rolled; sheet rolling, steel	RoW	m	13.00	29.43	kg	2.26 ⁸	29.43	2.5994	76.49	0.0127	0.37	0.0681	2.01	39.9104	1174.38	0.8821	25.96	0.00	0.00							
galvanised	zinc coating, coils	RoW	m ²	5.85		m ²	1.00	5.85	5.3066	31.04	0.30194	1.77	0.56793	3.32	106.3937	622.40	0.2808	1.64	0.00	0.00							
Additional Transport - from factory (100km)	transport, freight, lorry 3.5-7.5 metric ton, EURO3	RoW	tkm	11885.27	118852.69	tkm	1.00	11885.27	0.53068	6307.27	0.0030851	36.67	0.0062793	74.63	8.694566	103337.25	0.22901	2721.85									
Additional Transport - to landfill (10km)	transport, freight, lorry 3.5-7.5 metric ton, EURO3	RoW	tkm	55.40		tkm	1.00	55.40	0.53068	29.40	0.0030851	0.17	0.0062793	0.35	8.694566	481.68	0.22901	12.69									
Sub-Totals																		5619.31		5540.02							
PRE-USE PHASE IMPACT										30388.03		150.07		374.43		314398.95				11159.33							

SANS 10400-XA House: 04 CAST CONCRETE (200mm)																	E ₂ : Waste Generation			
Materials					Conversion			E ₁ : Carbon Footprint		E ₂ : Acidification Potential		E ₃ : Eutrophication Potential		E ₄ : Resource Depletion		Waste from Production		Construction Waste		
Item	Ecoinvent Equivalent	Loc	Unit	Quantity	Mass [kg]	Ecoinvent unit	Conversion factor	New Value	[kg CO ₂ /unit]	[kg CO _{2e} /item]	[kg SO ₂ /unit]	[kg SO _{2e} /item]	[kg NO _x /unit]	[kg NO _x /item]	[MJ-eq/unit]	[MJ-eq/item]	[kg/unit]	[kg/item]	[m ² /item]	[kg/item]
USE PHASE																				
REPLACEMENT OF PARTS																				
External walls 200 mm																				
Plaster externally (12mm thick)	4:1 ratio [silica sand production : cement production, Portland]	RoW	m ²	89.80	2478.44	kg	27.60	2478.44	0.2631	652.02	0.0007	1.83	0.0016	3.85	1.5682	3886.71	0.0072	17.72	0.03	74.35
Plaster internally (12mm thick)	4:1 ratio [silica sand production : cement production, Portland]	RoW	m ²	89.80	2478.44	kg	27.60	2478.44	0.2631	652.02	0.0007	1.83	0.0016	3.85	1.5682	3886.71	0.0072	17.72	0.03	74.35
Internal Walls 90 mm																				
Plaster, both sides (12mm thick)	4:1 ratio [silica sand production : cement production, Portland]	RoW	m ²	139.13	3840.08	kg	27.60	3840.08	0.2631	1010.23	0.0007	2.84	0.0016	5.96	1.5682	6022.07	0.0072	27.46	0.05	115.20
Ceiling and Thermal Insulation																				
6.4 mm gypsum plaster board	gypsum plasterboard production	RoW	m ²	91.00	518.70	kg	5.70	518.70	0.3901	202.35	0.0026	1.35	0.0065	3.36	5.1088	2649.95	0.0239	12.39	0.15	129.58
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornices)	glass wool mat production	RoW	m ²	91.00	527.80	kg	5.80	527.80	2.717	1434.03	0.021513	11.35	0.064579	34.08	49.498325	26125.22	0.20576	108.60	0.00	0.00
Roof Covering																				
0.54 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive	steel production, low-alloyed, hot rolled; sheet rolling, steel	RoW	m ²	100.87	507.37	kg	5.03	507.37	2.5994	1318.85	0.0127	6.42	0.0681	34.57	39.9104	20249.26	0.8821	447.57	0.00	47.04
"Zincalume" based steel sheeting	zinc coating, coils	RoW	m ²	100.87		m ²	1.00	100.87	5.3066	535.27	0.30194	30.46	0.56793	57.29	106.3937	10731.77	0.2808	28.32	0.00	0.00
Ridge cappings 450 mm girth	steel production, low-alloyed, hot rolled; sheet rolling, steel	RoW	m	13.00	29.43	kg	2.26	29.43	2.5994	76.49	0.0127	0.37	0.0681	2.01	39.9104	1174.38	0.8821	25.96	0.00	0.00
galvanised	zinc coating, coils	RoW	m ²	5.85		m ²	1.00	5.85	5.3066	31.04	0.30194	1.77	0.56793	3.32	106.3937	622.40	0.2808	1.64	0.00	0.00
Additional Transport - from factory (100km)	transport, freight, lorry 3.5-7.5 metric ton, EURO3	RoW	tkm	1038.03	10380.25	tkm	1.00	1038.03	0.53068	550.86	0.0030851	3.20	0.0062793	6.52	8.694566	9025.18	0.22901	237.72		
Additional Transport - to landfill (10km)	transport, freight, lorry 3.5-7.5 metric ton, EURO3	RoW	tkm	4.41		tkm	1.00	4.41	0.53068	2.34	0.0030851	0.01	0.0062793	0.03	8.694566	38.30	0.22901	1.01		
DISPOSAL OF OLD PARTS																				
External walls 200 mm																				
Plaster externally (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	89.80	2478.44	kg	27.60	2478.44	0.0087	21.63	0.0001	0.17	0.0001	0.33	0.2363	585.75	1.0022	2483.89		
Plaster internally (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	89.80	2478.44	kg	27.60	2478.44	0.0087	21.63	0.0001	0.17	0.0001	0.33	0.2363	585.75	1.0022	2483.89		
Internal Walls 90 mm																				
Plaster, both sides (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	139.13	3840.08	kg	27.60	3840.08	0.0087	33.51	0.0001	0.26	0.0001	0.51	0.2363	907.56	1.0022	3848.53		
Ceiling and Thermal Insulation																				
6.4 mm gypsum plaster board	treatment of waste gypsum, sanitary landfill	CH	m ²	91.00	518.70	kg	5.70	518.70	0.0122	6.34	0.0249	12.93	0.0002	0.12	0.3342	173.37	1.0037	520.62		
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornices)	treatment of waste mineral wool, inert material landfill	RoW	m ²	91.00	527.80	kg	5.80	527.80	0.0055	2.90	0.0000	0.03	0.0001	0.05	0.1829	96.54	0.9997	527.62		
Roof Covering																				
0.54 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive "Zincalume" based steel sheeting	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m ²	100.87	507.37	kg	5.03	507.37	0.0018	0.94	0.0000	0.01	0.0000	0.02	0.0281	14.23	0.0001	0.03		
Ridge cappings 450 mm girth	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m	100.87	228.32	kg	2.26	228.32	0.0018	0.42	0.0000	0.00	0.0000	0.01	0.0281	6.40	0.0001	0.01		
Additional Transport - to landfill (10km)	transport, freight, lorry 3.5-7.5 metric ton, EURO3	RoW	tkm	105.79	10579.14	tkm	1.00	105.79	0.53068	56.14	0.0030851	0.33	0.0062793	0.66	8.694566	919.81	0.22901	24.23		440.53
Sub-Totals: Materials										6608.99		75.34		156.86		87701.38		10814.92		440.53
Use Phase: Maintenance Impact	Number of maintenance cycles:			1						6608.99		75.34		156.86		87701.38		10814.92		11255.45
Electricity for Heating/Cooling	electricity production, hard coal	ZA	kWh/a	5402.20		kWh	1.00	5402.196774	1.1186	6042.90	0.011452	61.87	0.032065	173.22	15.4220204	83312.79	0.0051195	27.66		
Use Phase: Operation Impact	Design working life (years):			30																829.70
USE PHASE IMPACT										187895.91		1931.31		5353.51		2587085.04				12085.14

SANS 10400-XA House: 04 CAST CONCRETE (200mm)																		
Item	Materials			Conversion				E1: Carbon Footprint		E2: Acidification Potential		E3: Eutrophication Potential		E4: Resource Depletion		E5: Waste Generation		
	Ecoinvent Equivalent	Loc	Unit	Quantity	Mass [kg]	Ecoinvent unit	Conversion factor	New Value	[kg CO ₂ /unit]	[kg CO _{2e} /item]	[kg SO ₂ /unit]	[kg SO _{2e} /item]	[kg NO _x /unit]	[kg NO _x /item]	[MJ-eq/unit]	[MJ-eq/item]	Waste from Production [kg/unit]	Construction Waste [m ³ /item]
END-OF-LIFE PHASE																		
Foundations																		
10 MPa concrete foundation (600x200mm)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	7.32	17568.00	kg	2400.00	17568.00	0.0129	226.47	0.0001	1.90	0.00020334	3.57	0.3015	5296.36	1.0022	17606.65
Reinforcing (4 x Y12)	treatment of waste reinforcement steel, collection for final disposal	CH	kg	68.95	68.95	kg	1.00	68.95	0.1512	10.42	0.0010	0.07	0.020793	1.43	2.1420	147.70	0.2136	14.73
190 mm solid blockwork (foundation wall)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ²	16.00	4560.00	kg	285.00	4560.00	0.0129	58.78	0.0001	0.49	0.0002	0.93	0.3015	1374.74	1.0022	4570.03
400x210mm strip footing	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	3.36	7392.00	kg	2200.00	7392.00	0.0129	95.29	0.0001	0.80	0.0002	1.50	0.3015	2228.52	1.0022	7408.26
brickface (75x2.8mm)	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m	80.00	8.72	kg	0.11	8.72	0.0018	0.02	0.0000	0.00	0.0000	0.00	0.0281	0.24	0.0001	0.00
Floor Slab																		
Damp proof membrane 250 micron	treatment of waste polyethylene/polypropylene product, collection for final disposal	RoW	m ²	91.00	20.93	kg	0.23	20.93	0.3839	8.03	0.0001	0.00	0.0040	0.08	0.3704	7.75	0.9129	19.11
25 MPa concrete (power floated)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	9.10	21840.00	kg	2400.00	21840.00	0.0129	281.54	0.0001	2.36	0.0002	4.44	0.3015	6584.28	1.0022	21888.05
steel mesh ref 193	treatment of waste reinforcement steel, collection for final disposal	CH	m ²	91.00	175.63	kg	1.93	175.63	0.1512	26.55	0.0010	0.17	0.0208	3.65	2.1420	376.19	0.2136	37.51
External walls 200 mm																		
Cast concrete (200mm)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	17.96	43103.24	kg	2400.00	43103.24	0.0129	555.64	0.0001	4.65	0.0002	8.76	0.3015	12994.68	1.0022	43198.07
Plaster externally (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	89.80	2478.44	kg	27.60	2478.44	0.0087	21.63	0.0001	0.17	0.0001	0.33	0.2363	585.75	1.0022	2483.89
Plaster internally (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	89.80	2478.44	kg	27.60	2478.44	0.0087	21.63	0.0001	0.17	0.0001	0.33	0.2363	585.75	1.0022	2483.89
DPC - 375micron	treatment of waste polyethylene/polypropylene product, collection for final disposal	RoW	m	40.00	1.52	kg	0.04	1.52	0.3839	0.58	0.0001	0.00	0.0040	0.01	0.3704	0.56	0.9129	1.39
Internal Walls 90 mm																		
Solid blockwork, mortar	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ²	69.57	12869.85	kg	185.00	12869.85	0.0129	165.91	0.0001	1.39	0.0002	2.62	0.3015	3879.97	1.0022	12898.16
Plaster, both sides (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	139.13	3840.08	kg	27.60	3840.08	0.0087	33.51	0.0001	0.26	0.0001	0.51	0.2363	907.56	1.0022	3848.53
Ceiling and Thermal Insulation																		
6.4 mm gypsum plaster board	treatment of waste gypsum, sanitary landfill	CH	m ²	91.00	518.70	kg	5.70	518.70	0.0122	6.34	0.0249	12.93	0.0002	0.12	0.3342	173.37	1.0037	520.62
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (Incl cornices)	treatment of waste mineral wool, inert material landfill	RoW	m ²	91.00	527.80	kg	5.80	527.80	0.005503	2.90	4.74E-05	0.03	8.70E-05	0.05	0.18291267	96.54	0.99965	527.62
Roofing																		
Howe type truss to be designed by supplier for 7 m span	treatment of waste wood, untreated, municipal incineration	RoW	m ³	1.22	609.68	kg	500.00	609.68	0.0146	8.90	0.0002	0.10	0.0006	0.36	0.1663	101.40	0.0120	7.29
114x38 wall plate including beam filling	treatment of waste wood, untreated, municipal incineration	RoW	m ³	0.11	56.32	kg	500.00	56.32	0.0146	0.82	0.0002	0.01	0.0006	0.03	0.1663	9.37	0.0120	0.67
50x76 mm purlins on edge at maximum 1.2 m spacing	treatment of waste wood, untreated, municipal incineration	RoW	m ³	0.40	197.60	kg	500.00	197.60	0.0146	2.89	0.0002	0.03	0.0006	0.12	0.1663	32.86	0.0120	2.36
Roof Covering																		
0.54 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive "Zincalume" based steel sheeting	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m ²	100.87	507.37	kg	5.03	507.37	0.0018	0.94	0.0000	0.01	0.0000	0.02	0.0281	14.23	0.0001	0.03
Ridge cappings 450 mm girth	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m	13.00	29.43	kg	2.26	29.43	0.0018	0.05	0.0000	0.00	0.0000	0.00	0.0281	0.83	0.0001	0.00
Additional Transport - to landfill (10km)	transport, freight, lorry 3.5-7.5 metric ton, EURO3	RoW	tkm	1188.53	118852.69	tkm	1.00	1188.53	0.53068	630.73	0.0030851	3.67	0.0062793	7.46	8.694566	10333.73	0.22901	272.18
Sub-Totals																		
END-OF-LIFE PHASE IMPACT									2159.57		29.19		36.32		45732.38		117789.04	
TOTAL LIFE CYCLE IMPACT									220443.51		2110.58		5764.26		2947216.37		141033.51	

D5. EXTERNAL WALLING SYSTEM 05: INNOVIDA BUILDING SYSTEM

SANS 10400-XA House: 05 Innovida Building System																E ₁ : Waste Generation					
Item	Materials		Unit	Quantity	Mass [kg]	Conversion			E ₁ : Carbon Footprint		E ₂ : Acidification Potential		E ₃ : Eutrophication Potential		E ₄ : Resource Depletion		Waste from Production		Construction Waste		
	Ecoinvent Equivalent	Loc				Ecoinvent unit	Conversion factor	New Value	[kg CO ₂ e/unit]	[kg CO ₂ e/item]	[kg SO ₂ e/unit]	[kg SO ₂ e/item]	[kg NO _x /unit]	[kg NO _x /item]	[MJ-eq/unit]	[MJ-eq/item]	[kg/unit]	[kg/item]	[m ³ /item]	[kg/item]	
PRE-USE PHASE																					
Foundations																					
10 MPa concrete foundation (600x200mm)	concrete production, normal	RoW	m ³	7.32	17568.00	m ³	1.00	7.32	370.4100	2711.40	1.0317	7.55	2.4093	17.64	2478.2760	18140.98	36.7870	269.28	0.22	527.04	
Reinforcing (4 x Y12)	reinforcing steel production; section bar rolling, steel	RoW	kg	68.95	68.95	kg	1.00	68.95	2.6337	181.61	0.0107	0.74	0.0494903	3.41	34.5065	2379.37	0.6712	46.28	0.00	3.45	
190 mm solid blockwork (foundation wall)	concrete block production	RoW	m ²	16.00	4560.00	kg	285.00	4560.00	0.1807	824.08	0.0006	2.73	0.0018	8.08	1.4632	6672.04	0.0278	126.64	0.35	384.38	
400x210mm strip footing	concrete block production	RoW	m ³	3.36	7392.00	kg	2200.00	7392.00	0.1807	1335.88	0.0006	4.43	0.0018	13.11	1.4632	10815.73	0.0278	205.28	0.52	1153.15	
brickforce (75x2.8mm)	steel production, low-alloyed, hot rolled; wire drawing, steel	RoW	m	80.00	8.72	kg	0.11	8.72	2.6463	23.07	0.0120	0.10	0.0677	0.59	39.2618	342.21	0.9042	7.88	0.00	0.00	
galvanised	zinc coating, coils	RoW	m ²	1.57		m ²	1.00	1.57	5.3066	8.32	0.30194	0.47	0.56793	0.89	106.39365	166.83	0.28081	0.44	0.00	0.00	
Floor Slab																					
Damp proof membrane 250 micron	polyethylene production, low density, granulate; extrusion production, plastic film	RoW	m ²	91.00	20.93	kg	0.23	20.93	2.7305	57.15	0.0120	0.25	0.0277	0.58	83.9319	1756.70	0.0817	1.71	0.00	0.00	
25 MPa concrete (power floated)	concrete production, normal	RoW	m ³	9.10	21840.00	m ³	1.00	9.10	370.4100	3370.73	1.0317	9.39	2.4093	21.92	2478.2760	22552.31	36.7870	334.76	0.27	655.20	
steel mesh ref 193	reinforcing steel production; section bar rolling, steel	RoW	m ²	91.00	175.63	kg	1.93	175.63	2.6337	462.56	0.0107	1.88	0.0495	8.69	34.5065	6060.38	0.6712	117.89	0.00	8.78	
External walls 70mm																					
Expanded polyurethane core (60mm)	polyurethane production, rigid foam	RoW	m ³	5.39	12930.97	kg	24.00	129.31	4.4227	571.90	0.0195	2.53	0.0381	4.93	106.2237	13735.75	0.2054	26.56	0.05	1.29	
Resin-saturated glass fibre sheet (2x2mm)	glass fibre production	RoW	m ³	0.36	8.62	kg	24.00	8.62	2.4894	21.46	0.0213	0.18	0.0377	0.32	39.6574	341.87	0.2325	2.00	0.00	0.09	
Glass fibre base rail (70x60x2)	glass fibre production	RoW	m ³	0.02	0.36	kg	24.00	0.36	2.4894	0.91	0.0213	0.01	0.0377	0.01	39.6574	14.47	0.2325	0.08	0.00	0.00	
DPC - 375micron	polyethylene production, low density, granulate; extrusion production, plastic film	RoW	m	40.00	1.52	kg	0.04	1.52	2.7305	4.14	0.0120	0.02	0.0277	0.04	83.9319	127.41	0.0817	0.12	0.00	0.00	
Internal Walls 90 mm																					
Solid blockwork, mortar	concrete block production	RoW	m ²	69.57	12869.85	kg	185.00	12869.85	0.1807	2325.84	0.0006	7.72	0.0018	22.82	1.4632	18830.74	0.0278	357.41	0.98	1074.39	
Plaster, both sides (12mm thick)	4:1 ratio [silica sand production : cement production, Portland]	RoW	m ²	139.13	3840.08	kg	27.60	3840.08	0.2631	1010.23	0.0007	2.84	0.0016	5.96	1.5682	6022.07	0.0072	27.46	0.05	115.20	
Ceiling and Thermal Insulation																					
6.4 mm gypsum plaster board	gypsum plasterboard production	RoW	m ²	91.00	518.70	kg	5.70	518.70	0.3901	202.35	0.0026	1.35	0.0065	3.36	5.1088	2649.95	0.0239	12.39	0.15	129.58	
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornices)	glass wool mat production	RoW	m ²	91.00	527.80	kg	5.80	527.80	2.717	1434.03	0.021513	11.35	0.064579	34.08	49.498325	26125.22	0.20576	108.60	0.00	0.00	
Roofing																					
Howe type truss to be designed by supplier for 7 m span	planing, beam, softwood, air dried	RoW	m ³	1.22	609.68	m ³	1.00	1.22	105.2800	128.37	0.6861	0.84	5.8563	7.14	1666.1729	2031.66	39.9590	48.72	0.00	0.00	
114x38 wall plate including beam filling	planing, beam, softwood, air dried	RoW	m ³	0.11	56.32	m ³	1.00	0.11	105.2800	11.86	0.6861	0.08	5.8563	0.66	1666.1729	187.66	39.9590	4.50	0.00	0.00	
50x76 mm purlins on edge at maximum 1.2 m spacing	planing, beam, softwood, air dried	RoW	m ³	0.40	197.60	m ³	1.00	0.40	105.2800	41.61	0.6861	0.27	5.8563	2.31	1666.1729	658.47	39.9590	15.79	0.00	0.00	
Roof Covering																					
0.54 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive	steel production, low-alloyed, hot rolled; sheet rolling, steel	RoW	m ²	100.87	507.37	kg	5.03	507.37	2.5994	1318.85	0.0127	6.42	0.0681	34.57	39.9104	20249.26	0.8821	447.57	0.00	47.04	
"Zincalume" based steel sheeting	zinc coating, coils	RoW	m ²	100.87		m ²	1.00	100.87	5.3066	535.27	0.30194	30.46	0.56793	57.29	106.3937	10731.77	0.2808	28.32	0.00	0.00	
Ridge cappings 450 mm girth	steel production, low-alloyed, hot rolled; sheet rolling, steel	RoW	m	13.00	29.43	kg	2.26	29.43	2.5994	76.49	0.0127	0.37	0.0681	2.01	39.9104	1174.38	0.8821	25.96	0.00	0.00	
galvanised	zinc coating, coils	RoW	m ²	5.85		m ²	1.00	5.85	5.3066	31.04	0.30194	1.77	0.56793	3.32	106.3937	622.40	0.2808	1.64	0.00	0.00	
Additional Transport - from factory (100km)	transport, freight, lorry 3.5-7.5 metric ton, EURO3	RoW	tkm	8373.25	83732.53	tkm	1.00	8373.25	0.53068	4443.52	0.0030851	25.83	0.0062793	52.58	8.694566	72801.80	0.22901	1917.56			
Additional Transport - to landfill (10km)	transport, freight, lorry 3.5-7.5 metric ton, EURO3	RoW	tkm	41.00		tkm	1.00	41.00	0.53068	21.76	0.0030851	0.13	0.0062793	0.26	8.694566	356.44	0.22901	9.39			
Sub-Totals																				4099.60	
PRE-USE PHASE IMPACT																					8243.85

SANS 10400-XA House: 05 Innovida Building System																	E ₁ : Waste Generation				
Materials					Conversion			E ₁ : Carbon Footprint		E ₂ : Acidification Potential		E ₃ : Eutrophication Potential		E ₄ : Resource Depletion		Waste from Production		Construction Waste			
Item	Ecoinvent Equivalent	Loc	Unit	Quantity	Mass [kg]	Ecoinvent unit	Conversion factor	New Value	[kg CO ₂ e/unit]	[kg CO ₂ e/item]	[kg SO ₂ e/unit]	[kg SO ₂ e/item]	[kg NO _x /unit]	[kg NO _x /item]	[MJ-eq/unit]	[MJ-eq/item]	[kg/unit]	[kg/item]	[m ³ /item]	[kg/item]	
USE PHASE																					
REPLACEMENT OF PARTS																					
External walls 70mm																					
Resin-saturated glass fibre sheet (2x2mm)	glass fibre production		RoW	m ³	0.36	8.62	kg	24.00	8.62	0.2631	2.27	0.0007	0.01	0.0016	0.01	1.5682	13.52	0.0072	0.06	0.00	0.09
Internal Walls 90 mm																					
Plaster, both sides (12mm thick)	4:1 ratio [silica sand production : cement production, Portland]		RoW	m ²	139.13	3840.08	kg	27.60	3840.08	0.2631	1010.23	0.0007	2.84	0.0016	5.96	1.5682	6022.07	0.0072	27.46	0.05	115.20
Ceiling and Thermal Insulation																					
6.4 mm gypsum plaster board	gypsum plasterboard production		RoW	m ²	91.00	518.70	kg	5.70	518.70	0.3901	202.35	0.0026	1.35	0.0065	3.36	5.1088	2649.95	0.0239	12.39	0.15	129.58
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornices)	glass wool mat production		RoW	m ²	91.00	527.80	kg	5.80	527.80	2.717	1434.03	0.021513	11.35	0.064579	34.08	49.498325	26125.22	0.20576	108.60	0.00	0.00
Roof Covering																					
0.54 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive "Zincalume" based steel sheeting	steel production, low-alloyed, hot rolled; sheet rolling, steel		RoW	m ²	100.87	507.37	kg	5.03	507.37	2.5994	1318.85	0.0127	6.42	0.0681	34.57	39.9104	20249.26	0.8821	447.57	0.00	47.04
Ridge cappings 450 mm girth	zinc coating, coils		RoW	m ²	100.87		m ²	1.00	100.87	5.3066	535.27	0.30194	30.46	0.56793	57.29	106.3937	10731.77	0.2808	28.32	0.00	0.00
galvanised	steel production, low-alloyed, hot rolled; sheet rolling, steel		RoW	m	13.00	29.43	kg	2.26	29.43	2.5994	76.49	0.0127	0.37	0.0681	2.01	39.9104	1174.38	0.8821	25.96	0.00	0.00
	zinc coating, coils		RoW	m ²	5.85		m ²	1.00	5.85	5.3066	31.04	0.30194	1.77	0.56793	3.32	106.3937	622.40	0.2808	1.64	0.00	0.00
Additional Transport - from factory (100km)																					
transport, freight, lorry 3.5-7.5 metric ton, EURO3			RoW	tkm	543.20	5432.00	tkm	1.00	543.20	0.53068	288.27	0.0030851	1.68	0.0062793	3.41	8.694566	4722.89	0.22901	124.40		
Additional Transport - to landfill (10km)																					
transport, freight, lorry 3.5-7.5 metric ton, EURO3			RoW	tkm	2.92		tkm	1.00	2.92	0.53068	1.55	0.0030851	0.01	0.0062793	0.02	8.694566	25.38	0.22901	0.67		
DISPOSAL OF OLD PARTS																					
External walls 70mm																					
Resin-saturated glass fibre sheet (2x2mm)	treatment of waste glass, inert material landfill		CH	m ³	0.36	8.62	kg	24.00	8.62	0.0055	0.05	0.0000	0.00	0.0001	0.00	0.1829	1.58	0.9997	8.62		
Internal Walls 90 mm																					
Plaster, both sides (12mm thick)	treatment of waste mineral plaster, collection for final disposal		CH	m ²	139.13	3840.08	kg	27.60	3840.08	0.0087	33.51	0.0001	0.26	0.0001	0.51	0.2363	907.56	1.0022	3848.53		
Ceiling and Thermal Insulation																					
6.4 mm gypsum plaster board	treatment of waste gypsum, sanitary landfill		CH	m ²	91.00	518.70	kg	5.70	518.70	0.0122	6.34	0.0249	12.93	0.0002	0.12	0.3342	173.37	1.0037	520.62		
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornices)	treatment of waste mineral wool, inert material landfill		RoW	m ²	91.00	527.80	kg	5.80	527.80	0.0055	2.90	0.0000	0.03	0.0001	0.05	0.1829	96.54	0.9997	527.62		
Roof Covering																					
0.54 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive "Zincalume" based steel sheeting	treatment of waste bulk iron, excluding reinforcement, sorting plant		RoW	m ²	100.87	507.37	kg	5.03	507.37	0.0018	0.94	0.0000	0.01	0.0000	0.02	0.0281	14.23	0.0001	0.03		
Ridge cappings 450 mm girth	treatment of waste bulk iron, excluding reinforcement, sorting plant		RoW	m	100.87	228.32	kg	2.26	228.32	0.0018	0.42	0.0000	0.00	0.0000	0.01	0.0281	6.40	0.0001	0.01		
Additional Transport - to landfill (10km)																					
transport, freight, lorry 3.5-7.5 metric ton, EURO3			RoW	tkm	56.31	5630.89	tkm	1.00	56.31	0.53068	29.88	0.0030851	0.17	0.0062793	0.35	8.694566	489.58	0.22901	12.90		
Sub-Totals: Materials																					
Number of maintenance cycles: 1																					
Electricity for Heating/Cooling																					
Use Phase: Maintenance Impact																					
Use Phase: Operation Impact																					
Design working life (years): 30																					
USE PHASE IMPACT																					

SANS 10400-XA House: 05 Innovida Building System																E ₁ : Waste Generation				
Item	Materials			Conversion				E ₁ : Carbon Footprint		E ₂ : Acidification Potential		E ₃ : Eutrophication Potential		E ₄ : Resource Depletion		Waste from Production		Construction Waste		
	Ecoinvent Equivalent	Loc	Unit	Quantity	Mass [kg]	Ecoinvent unit	Conversion factor	New Value	[kg CO ₂ e/unit]	[kg CO ₂ e/item]	[kg SO ₂ e/unit]	[kg SO ₂ e/item]	[kg NO _x /unit]	[kg NO _x /item]	[MJ-eq/unit]	[MJ-eq/item]	[kg/unit]	[kg/item]	[m ³ /item]	[kg/item]
END-OF-LIFE PHASE																				
Foundations																				
10 MPa concrete foundation (600x200mm)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	7.32	17568.00	kg	2400.00	17568.00	0.0129	226.47	0.0001	1.90	0.00020334	3.57	0.3015	5296.36	1.0022	17606.65		
Reinforcing (4 x Y12)	treatment of waste reinforcement steel, collection for final disposal	CH	kg	68.95	68.95	kg	1.00	68.95	0.1512	10.42	0.0010	0.07	0.020793	1.43	2.1420	147.70	0.2136	14.73		
190 mm solid blockwork (foundation wall)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ²	16.00	4560.00	kg	285.00	4560.00	0.0129	58.78	0.0001	0.49	0.0002	0.93	0.3015	1374.74	1.0022	4570.03		
400x210mm strip footing	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	3.36	7392.00	kg	2200.00	7392.00	0.0129	95.29	0.0001	0.80	0.0002	1.50	0.3015	2228.52	1.0022	7408.26		
brickwork (75x2.8mm)	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m	80.00	8.72	kg	0.11	8.72	0.0018	0.02	0.0000	0.00	0.0000	0.00	0.0281	0.24	0.0001	0.00		
Floor Slab																				
Damp proof membrane 250 micron	treatment of waste polyethylene/polypropylene product, collection for final disposal	RoW	m ²	91.00	20.93	kg	0.23	20.93	0.3839	8.03	0.0001	0.00	0.0040	0.08	0.3704	7.75	0.9129	19.11		
25 MPa concrete (power floated)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	9.10	21840.00	kg	2400.00	21840.00	0.0129	281.54	0.0001	2.36	0.0002	4.44	0.3015	6584.28	1.0022	21888.05		
steel mesh ref 193	treatment of waste reinforcement steel, collection for final disposal	CH	m ²	91.00	175.63	kg	1.93	175.63	0.1512	26.55	0.0010	0.17	0.0208	3.65	2.1420	376.19	0.2136	37.51		
External walls 70mm																				
Expanded polyurethane core (60mm)	treatment of waste polyurethane, sanitary landfill	RoW	m ³	5.39	12930.97	kg	24.00	129.31	0.0910	11.77	0.0001	0.02	0.1915	24.76	0.3967	51.30	1.0025	129.63		
Resin-saturated glass fibre sheet (2x2mm)	treatment of waste glass, inert material landfill	CH	m ³	0.36	8.62	kg	24.00	8.62	0.0055	0.05	0.0000	0.00	0.0001	0.00	0.1829	1.58	0.9997	8.62		
Glass fibre base rail (70x60x2)	treatment of waste glass, inert material landfill	CH	m ³	0.02	0.36	kg	24.00	0.36	0.0055	0.00	0.0000	0.00	0.0001	0.00	0.1829	0.07	0.9997	0.36		
DPC - 375micron	treatment of waste polyethylene/polypropylene product, collection for final disposal	RoW	m	40.00	1.52	kg	0.04	1.52	0.3839	0.58	0.0001	0.00	0.0040	0.01	0.3704	0.56	0.9129	1.39		
Internal Walls 90 mm																				
Solid blockwork, mortar	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ²	69.57	12869.85	kg	185.00	12869.85	0.0129	165.91	0.0001	1.39	0.0002	2.62	0.3015	3879.97	1.0022	12898.16		
Plaster, both sides (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	139.13	3840.08	kg	27.60	3840.08	0.0087	33.51	0.0001	0.26	0.0001	0.51	0.2363	907.56	1.0022	3848.53		
Ceiling and Thermal Insulation																				
6.4 mm gypsum plaster board	treatment of waste gypsum, sanitary landfill	CH	m ²	91.00	518.70	kg	5.70	518.70	0.0122	6.34	0.0249	12.93	0.0002	0.12	0.3342	173.37	1.0037	520.62		
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornices)	treatment of waste mineral wool, inert material landfill	RoW	m ²	91.00	527.80	kg	5.80	527.80	0.005503	2.90	4.74E-05	0.03	8.70E-05	0.05	0.18291267	96.54	0.99965	527.62		
Roofing																				
Howe type truss to be designed by supplier for 7 m span	treatment of waste wood, untreated, municipal incineration	RoW	m ³	1.22	609.68	kg	500.00	609.68	0.0146	8.90	0.0002	0.10	0.0006	0.36	0.1663	101.40	0.0120	7.29		
114x38 wall plate including beam filling	treatment of waste wood, untreated, municipal incineration	RoW	m ³	0.11	56.32	kg	500.00	56.32	0.0146	0.82	0.0002	0.01	0.0006	0.03	0.1663	9.37	0.0120	0.67		
50x76 mm purlins on edge at maximum 1.2 m spacing	treatment of waste wood, untreated, municipal incineration	RoW	m ³	0.40	197.60	kg	500.00	197.60	0.0146	2.89	0.0002	0.03	0.0006	0.12	0.1663	32.86	0.0120	2.36		
Roof Covering																				
0.54 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive "Zincalume" based steel sheeting	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m ²	100.87	507.37	kg	5.03	507.37	0.0018	0.94	0.0000	0.01	0.0000	0.02	0.0281	14.23	0.0001	0.03		
Ridge cappings 450 mm girth	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m	13.00	29.43	kg	2.26	29.43	0.0018	0.05	0.0000	0.00	0.0000	0.00	0.0281	0.83	0.0001	0.00		
Additional Transport - to landfill (10km)	transport, freight, lorry 3.5-7.5 metric ton, EURO3	RoW	tkm	837.33	83732.53	tkm	1.00	837.33	0.53068	444.35	0.0030851	2.58	0.0062793	5.26	8.694566	7280.18	0.22901	191.76		
Sub-Totals																		69681.37		
END-OF-LIFE PHASE IMPACT									1386.12		23.14		49.46		28565.60			69681.37		
TOTAL LIFE CYCLE IMPACT									151708.03		1483.96		4061.18		2060376.95			84480.91		

D6. EXTERNAL WALLING SYSTEM 06: AFFORDABLE COMFORT HOMES

SANS 10400-XA House: 06 Affordable Comfort Homes

Item	Materials		Conversion		E ₁ : Carbon Footprint		E ₂ : Acidification Potential		E ₃ : Eutrophication Potential		E ₄ : Resource Depletion		E ₅ : Waste Generation								
													Waste from Production		Construction Waste						
													[kg/unit]	[kg/item]	[m ³ /item]	[kg/item]					
Item	Ecoinert Equivalent	Loc	Unit	Quantity	Mass [kg]	Ecoinert unit	Conversion factor	New Value	[kg CO ₂ e/unit]	[kg CO ₂ e/item]	[kg SO ₂ e/unit]	[kg SO ₂ e/item]	[kg NO _x /unit]	[kg NO _x /item]	[MJ-eq/unit]	[MJ-eq/item]	[kg/unit]	[kg/item]	[m ³ /item]	[kg/item]	
PRE-USE PHASE																					
Foundations																					
10 MPa concrete foundation (600x200mm)	concrete production, normal		RoW	m ³	7.32	17568.00	m ³	1.00	7.32	370.4100	2711.40	1.0317	7.55	2.4093	17.64	2478.2760	18140.98	36.7870	269.28	0.22	527.04
Reinforcing (4 x Y12)	reinforcing steel production; section bar rolling, steel		RoW	kg	68.95	68.95	kg	1.00	68.95	2.6337	181.61	0.0107	0.74	0.0494903	3.41	34.5065	2379.37	0.6712	46.28	0.00	3.45
190 mm solid blockwork (foundation wall)	concrete block production		RoW	m ²	16.00	4560.00	kg	285.00	4560.00	0.1807	824.08	0.0006	2.73	0.0018	8.08	1.4632	6672.04	0.0278	126.64	0.35	384.38
400x210mm strip footing	concrete block production		RoW	m ³	3.36	7392.00	kg	2200.00	7392.00	0.1807	1335.88	0.0006	4.43	0.0018	13.11	1.4632	10815.73	0.0278	205.28	0.52	1153.15
brickforce (75x2.8mm)	steel production, low-alloyed, hot rolled; wire drawing, steel		RoW	m	80.00	8.72	kg	0.11	8.72	2.6463	23.07	0.0120	0.10	0.0677	0.59	39.2618	342.21	0.9042	7.88	0.00	0.00
galvanised	zinc coating, coils		RoW	m ²	1.57		m ²	1.00	1.57	5.3066	8.32	0.30194	0.47	0.56793	0.89	106.39365	166.83	0.28081	0.44	0.00	0.00
Floor Slab																					
Damp proof membrane 250 micron	polyethylene production, low density, granulate; extrusion production, plastic film		RoW	m ²	91.00	20.93	kg	0.23	20.93	2.7305	57.15	0.0120	0.25	0.0277	0.58	83.9319	1756.70	0.0817	1.71	0.00	0.00
25 MPa concrete (power floated)	concrete production, normal		RoW	m ³	9.10	21840.00	m ³	1.00	9.10	370.4100	3370.73	1.0317	9.39	2.4093	21.92	2478.2760	22552.31	36.7870	334.76	0.27	655.20
steel mesh ref 193	reinforcing steel production; section bar rolling, steel		RoW	m ²	91.00	175.63	kg	1.93	175.63	2.6337	462.56	0.0107	1.88	0.0495	8.69	34.5065	6060.38	0.6712	117.89	0.00	8.78
External walls 60mm																					
Expanded polyurethane core (60mm)	polyurethane production, rigid foam		RoW	m ³	5.39	12930.97	kg	24.00	129.31	4.4227	571.90	0.0195	2.53	0.0381	4.93	106.2237	13735.75	0.2054	26.56	0.05	1.29
Gypsum plaster board (15mm)	gypsum plasterboard production		RoW	m ²	1.35	1212.28	kg	900.00	1212.28	0.3901	472.92	0.0026	3.15	0.0065	7.85	5.1088	6193.33	0.0239	28.95	0.34	303.07
Sheet steel (Zn0.6mm)	steel production, low-alloyed, hot rolled; sheet rolling, steel		RoW	m ²	0.11	840.51	kg	7800.00	840.51	2.5994	2184.82	0.0127	10.63	0.0681	57.28	39.9104	33545.19	0.8821	741.44	0.01	76.49
galvanised	zinc coating, coils		RoW	m ²	179.60		m ²	1.00	179.60	5.3066	953.05	0.30194	54.23	0.56793	102.00	106.39365	19107.96	0.28081	50.43	0.00	0.00
Steel fibre base rail (52x52x2)	steel production, low-alloyed, hot rolled; sheet rolling, steel		RoW	m ³	0.01	97.34	kg	7800.00	97.34	2.5994	253.04	0.0127	1.23	0.0681	6.63	39.9104	3885.03	0.8821	85.87	0.00	8.86
galvanised	zinc coating, coils		RoW	m ²	12.48		m ²	1.00	12.48	5.3066	66.23	0.30194	3.77	0.56793	7.09	106.39365	1327.79	0.28081	3.50	0.00	0.00
DPC - 375micron	polyethylene production, low density, granulate; extrusion production, plastic film		RoW	m	40.00	1.52	kg	0.04	1.52	2.7305	4.14	0.0120	0.02	0.0277	0.04	83.9319	127.41	0.0817	0.12	0.00	0.00
Internal Walls 90 mm																					
Solid blockwork, mortar	concrete block production		RoW	m ²	69.57	12869.85	kg	185.00	12869.85	0.1807	2325.84	0.0006	7.72	0.0018	22.82	1.4632	18830.74	0.0278	357.41	0.98	1074.39
Plaster, both sides (12mm thick)	4:1 ratio [silica sand production : cement production, Portland]		RoW	m ²	139.13	3840.08	kg	27.60	3840.08	0.2631	1010.23	0.0007	2.84	0.0016	5.96	1.5682	6022.07	0.0072	27.46	0.05	115.20
Ceiling and Thermal Insulation																					
6.4 mm gypsum plaster board	gypsum plasterboard production		RoW	m ²	91.00	518.70	kg	5.70	518.70	0.3901	202.35	0.0026	1.35	0.0065	3.36	5.1088	2649.95	0.0239	12.39	0.15	129.58
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornices)	glass wool mat production		RoW	m ³	91.00	527.80	kg	5.80	527.80	2.717	1434.03	0.021513	11.35	0.064579	34.08	49.498325	26125.22	0.20576	108.60	0.00	0.00
Roofing																					
Howe type truss to be designed by supplier for 7 m span	planing, beam, softwood, air dried		RoW	m ³	1.22	609.68	m ³	1.00	1.22	105.2800	128.37	0.6861	0.84	5.8563	7.14	1666.1729	2031.66	39.9590	48.72	0.00	0.00
114x38 wall plate including beam filling	planing, beam, softwood, air dried		RoW	m ³	0.11	56.32	m ³	1.00	0.11	105.2800	11.86	0.6861	0.08	5.8563	0.66	1666.1729	187.66	39.9590	4.50	0.00	0.00
50x76 mm purlins on edge at maximum 1.2 m spacing	planing, beam, softwood, air dried		RoW	m ³	0.40	197.60	m ³	1.00	0.40	105.2800	41.61	0.6861	0.27	5.8563	2.31	1666.1729	658.47	39.9590	15.79	0.00	0.00
Roof Covering																					
0.54 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive	steel production, low-alloyed, hot rolled; sheet rolling, steel		RoW	m ²	100.87	507.37	kg	5.03	507.37	2.5994	1318.85	0.0127	6.42	0.0681	34.57	39.9104	20249.26	0.8821	447.57	0.00	47.04
"Zincalume" based steel sheeting	zinc coating, coils		RoW	m ²	100.87		m ²	1.00	100.87	5.3066	535.27	0.30194	30.46	0.56793	57.29	106.3937	10731.77	0.2808	28.32	0.00	0.00
Ridge cappings 450 mm girth	steel production, low-alloyed, hot rolled; sheet rolling, steel		RoW	m	13.00	29.43	kg	2.26	29.43	2.5994	76.49	0.0127	0.37	0.0681	2.01	39.9104	1174.38	0.8821	25.96	0.00	0.00
galvanised	zinc coating, coils		RoW	m ²	5.85		m ²	1.00	5.85	5.3066	31.04	0.30194	1.77	0.56793	3.32	106.3937	622.40	0.2808	1.64	0.00	0.00
Additional Transport - from factory (100km)																					
	transport, freight, lorry 3.5-7.5 metric ton, EURO3		RoW	tkm	8587.37	85873.68	tkm	1.00	8587.37	0.53068	4557.14	0.0030851	26.49	0.0062793	53.92	8.694566	74663.44	0.22901	1966.59		
Additional Transport - to landfill (10km)																					
	transport, freight, lorry 3.5-7.5 metric ton, EURO3		RoW	tkm	44.88		tkm	1.00	44.88	0.53068	23.82	0.0030851	0.14	0.0062793	0.28	8.694566	390.21	0.22901	10.28		
Sub-Totals																					
										25177.79		193.20		488.47		311146.23				5102.28	4487.93
PRE-USE PHASE IMPACT																					

SANS 10400-XA House: 06 Affordable Comfort Homes

Item	Materials			Conversion				E ₁ : Carbon Footprint		E ₂ : Acidification Potential		E ₃ : Eutrophication Potential		E ₄ : Resource Depletion		E ₅ : Waste Generation						
	Ecoinvent Equivalent	Loc	Unit	Quantity	Mass [kg]	Ecoinvent unit	Conversion factor	New Value	[kg CO ₂ /unit]	[kg CO ₂ /item]	[kg SO ₂ /unit]	[kg SO ₂ /item]	[kg NO _x /unit]	[kg NO _x /item]	[MJ-eq/unit]	[MJ-eq/item]	Waste from Production	Construction Waste	[kg/unit]	[kg/item]	[m ³ /item]	[kg/item]
USE PHASE																						
REPLACEMENT OF PARTS																						
External walls 60mm																						
Gypsum plaster board (15mm)	gypsum plasterboard production	RoW	m ³	1.35	1212.28	kg	900.00 ¹³	1212.28	0.3901	472.92	0.0026	3.15	0.0065	7.85	5.1088	6193.33	0.0239	28.95	0.34	303.07		
Internal Walls 90 mm																						
Plaster, both sides (12mm thick)	4:1 ratio [silica sand production : cement production, Portland]	RoW	m ²	139.13	3840.08	kg	27.60 ⁵	3840.08	0.2631	1010.23	0.0007	2.84	0.0016	5.96	1.5682	6022.07	0.0072	27.46	0.05	115.20		
Ceiling and Thermal Insulation																						
6.4 mm gypsum plaster board	gypsum plasterboard production	RoW	m ²	91.00	518.70	kg	5.70 ⁶	518.70	0.3901	202.35	0.0026	1.35	0.0065	3.36	5.1088	2649.95	0.0239	12.39	0.15	129.58		
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornices)	glass wool mat production	RoW	m ²	91.00	527.80	kg	5.80 ⁷	527.80	2.717	1434.03	0.021513	11.35	0.064579	34.08	49.498325	26125.22	0.20576	108.60	0.00	0.00		
Roof Covering																						
0.54 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive	steel production, low-alloyed, hot rolled; sheet rolling, steel	RoW	m ²	100.87	507.37	kg	5.03 ⁸	507.37	2.5994	1318.85	0.0127	6.42	0.0681	34.57	39.9104	20249.26	0.8821	447.57	0.00	47.04		
"Zincalume" based steel sheeting	zinc coating, coils	RoW	m ²	100.87		m ²	1.00	100.87	5.3066	535.27	0.30194	30.46	0.56793	57.29	106.3937	10731.77	0.2808	28.32	0.00	0.00		
Ridge cappings 450 mm girth	steel production, low-alloyed, hot rolled; sheet rolling, steel	RoW	m	13.00	29.43	kg	2.26 ⁸	29.43	2.5994	76.49	0.0127	0.37	0.0681	2.01	39.9104	1174.38	0.8821	25.96	0.00	0.00		
galvanised	zinc coating, coils	RoW	m ²	5.85		m ²	1.00	5.85	5.3066	31.04	0.30194	1.77	0.56793	3.32	106.3937	622.40	0.2808	1.64	0.00	0.00		
Additional Transport - from factory (100km)																						
transport, freight, lorry 3.5-7.5 metric ton, EURO3		RoW	tkm	663.57	6635.66	tkm	1.00	663.57	0.53068	352.14	0.0030851	2.05	0.0062793	4.17	8.694566	5769.42	0.22901	151.96				
Additional Transport - to landfill (10km)																						
transport, freight, lorry 3.5-7.5 metric ton, EURO3		RoW	tkm	5.95		tkm	1.00	5.95	0.53068	3.16	0.0030851	0.02	0.0062793	0.04	8.694566	51.72	0.22901	1.36				
DISPOSAL OF OLD PARTS																						
External walls 60mm																						
Gypsum plaster board (15mm)	treatment of waste gypsum, sanitary landfill	CH	m ³	1.35	1212.28	kg	900.00 ¹³	1212.28	0.0122	14.81	0.0249	30.21	0.0002	0.29	0.3342	405.19	1.0037	1216.76				
Internal Walls 90 mm																						
Plaster, both sides (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	139.13	3840.08	kg	27.60 ⁵	3840.08	0.0087	33.51	0.0001	0.26	0.0001	0.51	0.2363	907.56	1.0022	3848.53				
Ceiling and Thermal Insulation																						
6.4 mm gypsum plaster board	treatment of waste gypsum, sanitary landfill	CH	m ²	91.00	518.70	kg	5.70 ⁶	518.70	0.0122	6.34	0.0249	12.93	0.0002	0.12	0.3342	173.37	1.0037	520.62				
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornices)	treatment of waste mineral wool, inert material landfill	RoW	m ²	91.00	527.80	kg	5.80 ⁷	527.80	0.0055	2.90	0.0000	0.03	0.0001	0.05	0.1829	96.54	0.9997	527.62				
Roof Covering																						
0.54 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive "Zincalume" based steel sheeting	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m ²	100.87	507.37	kg	5.03 ⁸	507.37	0.0018	0.94	0.0000	0.01	0.0000	0.02	0.0281	14.23	0.0001	0.03				
Ridge cappings 450 mm girth	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m	100.87	228.32	kg	2.26 ⁸	228.32	0.0018	0.42	0.0000	0.00	0.0000	0.01	0.0281	6.40	0.0001	0.01				
Additional Transport - to landfill (10km)																						
transport, freight, lorry 3.5-7.5 metric ton, EURO3		RoW	tkm	68.35	6834.55	tkm	1.00	68.35	0.53068	36.27	0.0030851	0.21	0.0062793	0.43	8.694566	594.23	0.22901	15.65				
Sub-Totals: Materials																						
Use Phase: Maintenance Impact										Number of maintenance cycles: 1												
Electricity for Heating/Cooling	electricity production, hard coal	ZA	kWh/a	3634.86		kWh	1.00	3634.863247	1.1186	4065.96	0.01452	41.63	0.032065	116.55	15.4220204	56056.94	0.0051195	18.61				
Use Phase: Operation Impact										Design working life (years): 30												
										5531.67												
										103.42												
										154.07												
										81787.05												
										81787.05												
										6963.43												
										594.90												
USE PHASE IMPACT																						
										127510.41												
										1352.22												
										3650.63												
										1763495.11												
										8116.59												

SANS 10400-XA House: 06 Affordable Comfort Homes

																E ₂ : Waste Generation				
Materials		Conversion				E ₁ : Carbon Footprint		E ₂ : Acidification Potential		E ₃ : Eutrophication Potential		E ₄ : Resource Depletion		Waste from Production		Construction Waste				
Item	Ecoinvent Equivalent	Loc	Unit	Quantity	Mass [kg]	Ecoinvent unit	Conversion factor	New Value	[kg CO ₂ /unit]	[kg CO ₂ /item]	[kg SO ₂ /unit]	[kg SO ₂ /item]	[kg NO _x /unit]	[kg NO _x /item]	[MJ-eq/unit]	[MJ-eq/item]	[kg/unit]	[kg/item]	[m ³ /item]	[kg/item]
END-OF-LIFE PHASE																				
Foundations																				
10 MPa concrete foundation (600x200mm)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	7.32	17568.00	kg	2400.00	17568.00	0.0129	226.47	0.0001	1.90	0.00020334	3.57	0.3015	5296.36	1.0022	17606.65		
Reinforcing (4 x Y12)	treatment of waste reinforcement steel, collection for final disposal	CH	kg	68.95	68.95	kg	1.00	68.95	0.1512	10.42	0.0010	0.07	0.020793	1.43	2.1420	147.70	0.2136	14.73		
190 mm solid blockwork (foundation wall)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ²	16.00	4560.00	kg	285.00	4560.00	0.0129	58.78	0.0001	0.49	0.0002	0.93	0.3015	1374.74	1.0022	4570.03		
400x210mm strip footing	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	3.36	7392.00	kg	2200.00	7392.00	0.0129	95.29	0.0001	0.80	0.0002	1.50	0.3015	2228.52	1.0022	7408.26		
brickforce (75x2.8mm)	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m	80.00	8.72	kg	0.11	8.72	0.0018	0.02	0.0000	0.00	0.0000	0.00	0.0281	0.24	0.0001	0.00		
Floor Slab																				
Damp proof membrane 250 micron	treatment of waste polyethylene/polypropylene product, collection for final disposal	RoW	m ²	91.00	20.93	kg	0.23	20.93	0.3839	8.03	0.0001	0.00	0.0040	0.08	0.3704	7.75	0.9129	19.11		
25 MPa concrete (power floated)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ²	9.10	21840.00	kg	2400.00	21840.00	0.0129	281.54	0.0001	2.36	0.0002	4.44	0.3015	6584.28	1.0022	21888.05		
steel mesh ref 193	treatment of waste reinforcement steel, collection for final disposal	CH	m ²	91.00	175.63	kg	1.93	175.63	0.1512	26.55	0.0010	0.17	0.0208	3.65	2.1420	376.19	0.2136	37.51		
External walls 60mm																				
Expanded polystyrene core (60mm)	treatment of waste polystyrene, sanitary landfill	RoW	m ³	5.39	12930.97	kg	24.00	129.31	0.0910	11.77	0.0001	0.02	0.1915	24.76	0.3967	51.30	1.0025	129.63		
Gypsum plaster board (15mm)	treatment of waste gypsum, sanitary landfill	CH	m ³	1.35	1212.28	kg	900.00	1212.28	0.0122	14.81	0.0249	30.21	0.0002	0.29	0.3342	405.19	1.0037	1216.76		
Sheet steel (2x0.6mm)	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m ³	0.11	840.51	kg	7800.00	840.51	0.0018	1.55	0.0000	0.01	0.0000	0.04	0.0281	23.58	0.0001	0.04		
Steel fibre base rail (52x52x2)	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m ³	0.01	97.34	kg	7800.00	97.34	0.0018	0.18	0.0000	0.00	0.0000	0.00	0.0281	2.73	0.0001	0.01		
DPC - 375micron	treatment of waste polyethylene/polypropylene product, collection for final disposal	RoW	m	40.00	1.52	kg	0.04	1.52	0.3839	0.58	0.0001	0.00	0.0040	0.01	0.3704	0.56	0.9129	1.39		
Internal Walls 90 mm																				
Solid blockwork, mortar	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ²	69.57	12869.85	kg	185.00	12869.85	0.0129	165.91	0.0001	1.39	0.0002	2.62	0.3015	3879.97	1.0022	12898.16		
Plaster, both sides (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	139.13	3840.08	kg	27.60	3840.08	0.0087	33.51	0.0001	0.26	0.0001	0.51	0.2363	907.56	1.0022	3848.53		
Ceiling and Thermal Insulation																				
6.4 mm gypsum plaster board	treatment of waste gypsum, sanitary landfill	CH	m ²	91.00	518.70	kg	5.70	518.70	0.0122	6.34	0.0249	12.93	0.0002	0.12	0.3342	173.37	1.0037	520.62		
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornices)	treatment of waste mineral wool, inert material landfill	RoW	m ²	91.00	527.80	kg	5.80	527.80	0.005503	2.90	4.74E-05	0.03	8.70E-05	0.05	0.18291267	96.54	0.99965	527.62		
Roofing																				
Howe type truss to be designed by supplier for 7 m span	treatment of waste wood, untreated, municipal incineration	RoW	m ³	1.22	609.68	kg	500.00	609.68	0.0146	8.90	0.0002	0.10	0.0006	0.36	0.1663	101.40	0.0120	7.29		
114x38 wall plate including beam filling	treatment of waste wood, untreated, municipal incineration	RoW	m ³	0.11	56.32	kg	500.00	56.32	0.0146	0.82	0.0002	0.01	0.0006	0.03	0.1663	9.37	0.0120	0.67		
50x76 mm purlins on edge at maximum 1.2 m spacing	treatment of waste wood, untreated, municipal incineration	RoW	m ³	0.40	197.60	kg	500.00	197.60	0.0146	2.89	0.0002	0.03	0.0006	0.12	0.1663	32.86	0.0120	2.36		
Roof Covering																				
0.54 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive "Zincalume" based steel sheeting	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m ²	100.87	507.37	kg	5.03	507.37	0.0018	0.94	0.0000	0.01	0.0000	0.02	0.0281	14.23	0.0001	0.03		
Ridge cappings 450 mm girth	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m	13.00	29.43	kg	2.26	29.43	0.0018	0.05	0.0000	0.00	0.0000	0.00	0.0281	0.83	0.0001	0.00		
Additional Transport - to landfill (10km)																				
Sub-Totals	transport, freight, lorry 3.5-7.5 metric ton, EURO3	RoW	tkm	858.74	85873.68	tkm	1.00	858.74	0.53068	455.71	0.0030851	2.65	0.0062793	5.39	8.694566	7466.34	0.22901	196.66		
END-OF-LIFE PHASE IMPACT										1413.97		53.43		49.92		29181.63		70894.11		70894.11
TOTAL LIFE CYCLE IMPACT										154102.17		1598.85		4189.01		2103822.97				88600.91

D7. EXTERNAL WALLING SYSTEM 07: MG SIP BUILDING SYSTEM

SANS 10400-XA House: 07 MG SIP BUILDING SYSTEM																E ₁ : Waste Generation					
Materials						Conversion			E ₁ : Carbon Footprint		E ₁ : Acidification Potential		E ₁ : Eutrophication Potential		E ₁ : Resource Depletion		Waste from Production		Construction Waste		
Item	Ecoinvent Equivalent	Loc	Unit	Quantity	Mass [kg]	Ecoinvent unit	Conversion factor	New Value	[kg CO _{2e} /unit]	[kg CO _{2e} /item]	[kg SO _{2e} /unit]	[kg SO _{2e} /item]	[kg NO _x /unit]	[kg NO _x /item]	[MJ-eq/unit]	[MJ-eq/item]	[kg/unit]	[kg/item]	[m ³ /item]	[kg/item]	
PRE-USE PHASE																					
Foundations																					
10 MPa concrete foundation (600x200mm)	concrete production, normal		RoW	m ³	7.32	17568.00	m ³	1.00	7.32	370.4100	2711.40	1.0317	7.55	2.4093	17.64	2478.2760	18140.98	36.7870	269.28	0.22	527.04
Reinforcing (4 x Y12)	reinforcing steel production; section bar rolling, steel		RoW	kg	68.95	68.95	kg	1.00	68.95	2.6337	181.61	0.0107	0.74	0.0494903	3.41	34.5065	2379.37	0.6712	46.28	0.00	3.45
190 mm solid blockwork (foundation wall)	concrete block production		RoW	m ²	16.00	4560.00	kg	285.00	4560.00	0.1807	824.08	0.0006	2.73	0.0018	8.08	1.4632	6672.04	0.0278	126.64	0.35	384.38
400x210mm strip footing	concrete block production		RoW	m ³	3.36	7392.00	kg	2200.00	7392.00	0.1807	1335.88	0.0006	4.43	0.0018	13.11	1.4632	10815.73	0.0278	205.28	0.52	1153.15
brickforce (75x2.8mm)	steel production, low-alloyed, hot rolled; wire drawing, steel		RoW	m	80.00	8.72	kg	0.11	8.72	2.6463	23.07	0.0120	0.10	0.0677	0.59	39.2618	342.21	0.9042	7.88	0.00	0.00
galvanised	zinc coating, coils		RoW	m ²	1.57		m ²	1.00	1.57	5.3066	8.32	0.30194	0.47	0.56793	0.89	106.39365	166.83	0.28081	0.44	0.00	0.00
Floor Slab																					
Damp proof membrane 250 micron	polyethylene production, low density, granulate; extrusion production, plastic film		RoW	m ²	91.00	20.93	kg	0.23	20.93	2.7305	57.15	0.0120	0.25	0.0277	0.58	83.9319	1756.70	0.0817	1.71	0.00	0.00
25 MPa concrete (power floated)	concrete production, normal		RoW	m ³	9.10	21840.00	m ³	1.00	9.10	370.4100	3370.73	1.0317	9.39	2.4093	21.92	2478.2760	22552.31	36.7870	334.76	0.27	655.20
steel mesh ref 193	reinforcing steel production; section bar rolling, steel		RoW	m ²	91.00	175.63	kg	1.93	175.63	2.6337	462.56	0.0107	1.88	0.0495	8.69	34.5065	6060.38	0.6712	117.89	0.00	8.78
External walls (125mm)																					
Expanded polyurethane core (103mm)	polyurethane production, rigid foam		RoW	m ³	9.25	22198.17	kg	24.00	221.98	4.4227	981.76	0.0195	4.34	0.0381	8.46	106.2237	23579.71	0.2054	45.60	0.09	2.22
Gypsum plaster board (15mm)	gypsum plasterboard production		RoW	m ³	1.35	1212.28	kg	900.00	1212.28	0.3901	472.92	0.0026	3.15	0.0065	7.85	5.1088	6193.33	0.0239	28.95	0.34	303.07
Oriented strand board (2x11mm)	oriented strand board production		RoW	m ³	1.98	1284.12	m ³	1.00	1.98	320.2200	632.62	2.1864	4.32	10.5680	20.88	6222.8060	12293.56	58.3870	115.35	0.49	0.49
Medium density fibre-cement board (12mm)	fibre cement corrugated slab production		RoW	m ³	1.08	862.06	kg	800.00	862.06	0.87978	758.43	0.0036862	3.18	0.012179	10.50	9.23963	7965.16	0.064818	55.88	0.27	215.52
Steel fibre base rail (127x52x2)	steel production, low-alloyed, hot rolled; sheet rolling, steel		RoW	m ³	0.02	144.14	kg	7800.00	144.14	320.2200	46157.79	2.1864	315.16	10.5680	1523.31	6222.8060	896980.15	58.3870	8416.14	0.00	13.12
galvanised	zinc coating, coils		RoW	m ²	18.48		m ²	1.00	18.48	0.87978	16.26	0.0036862	0.07	0.012179	0.23	9.23963	170.75	0.064818	1.20	0.00	0.00
Branding (38x38mm @300mm)	planing, beam, softwood, air dried		RoW	m ³	1.04	519.84	m ³	1.00	1.04	105.2800	109.46	0.6861	0.71	5.8563	6.09	1666.1729	1732.29	39.9590	41.54	0.00	0.00
DPC - 375micron	polyethylene production, low density, granulate; extrusion production, plastic film		RoW	m	40.00	1.52	kg	0.04	1.52	2.7305	4.14	0.0120	0.02	0.0277	0.04	83.9319	127.41	0.0817	0.12	0.00	0.00
Internal Walls 90 mm																					
Solid blockwork, mortar	concrete block production		RoW	m ²	69.57	12869.85	kg	185.00	12869.85	0.1807	2325.84	0.0006	7.72	0.0018	22.82	1.4632	18830.74	0.0278	357.41	0.98	1074.39
Plaster, both sides (12mm thick)	4:1 ratio [silica sand production : cement production, Portland]		RoW	m ²	139.13	3840.08	kg	27.60	3840.08	0.2631	1010.23	0.0007	2.84	0.0016	5.96	1.5682	6022.07	0.0072	27.46	0.05	115.20
Ceiling and Thermal Insulation																					
6.4 mm gypsum plaster board	gypsum plasterboard production		RoW	m ²	91.00	518.70	kg	5.70	518.70	0.3901	202.35	0.0026	1.35	0.0065	3.36	5.1088	2649.95	0.0239	12.39	0.15	129.58
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornices)	glass wool mat production		RoW	m ²	91.00	527.80	kg	5.80	527.80	2.717	1434.03	0.021513	11.35	0.064579	34.08	49.498325	26125.22	0.20576	108.60	0.00	0.00
Roofing																					
Howe type truss to be designed by supplier for 7 m span	planing, beam, softwood, air dried		RoW	m ³	1.22	609.68	m ³	1.00	1.22	105.2800	128.37	0.6861	0.84	5.8563	7.14	1666.1729	2031.66	39.9590	48.72	0.00	0.00
114x38 wall plate including beam filling	planing, beam, softwood, air dried		RoW	m ³	0.11	56.32	m ³	1.00	0.11	105.2800	11.86	0.6861	0.08	5.8563	0.66	1666.1729	187.66	39.9590	4.50	0.00	0.00
50x76 mm purlins on edge at maximum 1.2 m spacing	planing, beam, softwood, air dried		RoW	m ³	0.40	197.60	m ³	1.00	0.40	105.2800	41.61	0.6861	0.27	5.8563	2.31	1666.1729	658.47	39.9590	15.79	0.00	0.00
Roof Covering																					
0.54 mm Fielders corrugated Colorbond (550 AZ150 anti-corrosive	steel production, low-alloyed, hot rolled; sheet rolling, steel		RoW	m ²	100.87	507.37	kg	5.03	507.37	2.5994	1318.85	0.0127	6.42	0.0681	34.57	39.9104	20249.26	0.8821	447.57	0.00	47.04
"Zincalume" based steel sheeting	zinc coating, coils		RoW	m ²	100.87		m ²	1.00	100.87	5.3066	535.27	0.30194	30.46	0.56793	57.29	106.3937	10731.77	0.2808	28.32	0.00	0.00
Ridge cappings 450 mm girth	steel production, low-alloyed, hot rolled; sheet rolling, steel		RoW	m	13.00	29.43	kg	2.26	29.43	2.5994	76.49	0.0127	0.37	0.0681	2.01	39.9104	1174.38	0.8821	25.96	0.00	0.00
galvanised	zinc coating, coils		RoW	m ²	5.85		m ²	1.00	5.85	5.3066	31.04	0.30194	1.77	0.56793	3.32	106.3937	622.40	0.2808	1.64	0.00	0.00
Additional Transport - from factory (100km)																					
Additional Transport - to landfill (10km)	transport, freight, lorry 3.5-7.5 metric ton, EURO3		RoW	tkm	9701.32	97013.19	tkm	1.00	9701.32	0.53068	5148.30	0.0030851	29.93	0.0062793	60.92	8.694566	84348.75	0.22901	2221.70		
Sub-Totals																					4632.64
PRE-USE PHASE IMPACT										70396.99		452.03		1887.01		1191964.01		13125.61		17758.24	

SANS 10400-XA House: 07 MG SIP BUILDING SYSTEM																	E ₁ : Waste Generation							
Materials					Conversion				E ₁ : Carbon Footprint		E ₁ : Acidification Potential		E ₁ : Eutrophication Potential		E ₁ : Resource Depletion		Waste from Production		Construction Waste					
Item	Ecoinvent Equivalent	Loc	Unit	Quantity	Mass [kg]	Ecoinvent unit	Conversion factor	New Value	[kg CO ₂ e/unit]	[kg CO ₂ e/item]	[kg SO ₂ e/unit]	[kg SO ₂ e/item]	[kg NO _x e/unit]	[kg NO _x e/item]	[MJ-eq/unit]	[MJ-eq/item]	[kg/unit]	[kg/Item]	[m ³ /Item]	[kg/Item]				
USE PHASE																								
REPLACEMENT OF PARTS																								
External walls (125mm)																								
Gypsum plaster board (15mm)	gypsum plasterboard production	RoW	m ³	1.35	1212.28	kg	900.00 ¹⁹	1212.28	0.3901	472.92	0.0026	3.15	0.0065	7.85	5.1088	6193.33	0.0239	28.95	0.34	303.07				
Medium density fibre-cement board (12mm)	fibre cement corrugated slab production	RoW	m ³	1.08	862.06	kg	800.00	862.06	0.87978	758.43	0.0036862	3.18	0.012179	10.50	9.23963	7965.16	0.064818	55.88	0.00	0.00				
Internal Walls 90 mm																								
Plaster, both sides (12mm thick)	4:1 ratio [silica sand production : cement production, Portland]	RoW	m ²	139.13	3840.08	kg	27.60	3840.08	0.2631	1010.23	0.0007	2.84	0.0016	5.96	1.5682	6022.07	0.0072	27.46	0.05	115.20				
Ceiling and Thermal Insulation																								
6.4 mm gypsum plaster board	gypsum plasterboard production	RoW	m ²	91.00	518.70	kg	5.70	518.70	0.3901	202.35	0.0026	1.35	0.0065	3.36	5.1088	2649.95	0.0239	12.39	0.15	129.58				
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornices)	glass wool mat production	RoW	m ²	91.00	527.80	kg	5.80	527.80	2.717	1434.03	0.021513	11.35	0.064579	34.08	49.498325	26125.22	0.20576	108.60	0.00	0.00				
Roof Covering																								
0.54 mm Fielders corrugated Colorbond G550 A2150 anti-corrosive "Zincalume" based steel sheeting	steel production, low-alloyed, hot rolled; sheet rolling, steel	RoW	m ²	100.87	507.37	kg	5.03	507.37	2.5994	1318.85	0.0127	6.42	0.0681	34.57	39.9104	20249.26	0.8821	447.57	0.00	47.04				
	zinc coating, coils	RoW	m ²	100.87		m ²	1.00	100.87	5.3066	535.27	0.30194	30.46	0.56793	57.29	106.3937	10731.77	0.2808	28.32	0.00	0.00				
Ridge cappings 450 mm girth	steel production, low-alloyed, hot rolled; sheet rolling, steel	RoW	m	13.00	29.43	kg	2.26	29.43	2.5994	76.49	0.0127	0.37	0.0681	2.01	39.9104	1174.38	0.8821	25.96	0.00	0.00				
	galvanised zinc coating, coils	RoW	m ²	5.85		m ²	1.00	5.85	5.3066	31.04	0.30194	1.77	0.56793	3.32	106.3937	622.40	0.2808	1.64	0.00	0.00				
										0.00		0.00		0.00		0.00				0.00				
Additional Transport - from factory (100km)	transport, freight, lorry 3.5-7.5 metric ton, EURO3	RoW	tkm	749.77	7497.72	tkm	1.00	749.77	0.53068	397.89	0.0030851	2.31	0.0062793	4.71	8.694566	6518.94	0.22901	171.71						
Additional Transport - to landfill (10km)	transport, freight, lorry 3.5-7.5 metric ton, EURO3	RoW	tkm	5.95		tkm	1.00	5.95	0.53068	3.16	0.0030851	0.02	0.0062793	0.04	8.694566	51.72	0.22901	1.36						
DISPOSAL OF OLD PARTS																								
External walls (125mm)																								
Gypsum plaster board (15mm)	treatment of waste gypsum, sanitary landfill	CH	m ³	1.35	1212.28	kg	900.00	1212.28	0.0122	14.81	0.0249	30.21	0.0002	0.29	0.3342	405.19	1.0037	1216.76						
Medium density fibre-cement board (12mm)	treatment of waste fibreboard, collection for final disposal	RoW	m ³	1.08	862.06	kg	800.00	862.06	0.0961	82.88	0.0005	0.44	0.0063	5.46	0.3406	293.61	0.0648	55.85						
Internal Walls 90 mm																								
Plaster, both sides (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	139.13	3840.08	kg	27.60	3840.08	0.0087	33.51	0.0001	0.26	0.0001	0.51	0.2363	907.56	1.0022	3848.53						
Ceiling and Thermal Insulation																								
6.4 mm gypsum plaster board	treatment of waste gypsum, sanitary landfill	CH	m ²	91.00	518.70	kg	5.70	518.70	0.0122	6.34	0.0249	12.93	0.0002	0.12	0.3342	173.37	1.0037	520.62						
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornices)	treatment of waste mineral wool, inert material landfill	RoW	m ²	91.00	527.80	kg	5.80	527.80	0.0055	2.90	0.0000	0.03	0.0001	0.05	0.1829	96.54	0.9997	527.62						
Roof Covering																								
0.54 mm Fielders corrugated Colorbond G550 A2150 anti-corrosive "Zincalume" based steel sheeting	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m ²	100.87	507.37	kg	5.03	507.37	0.0018	0.94	0.0000	0.01	0.0000	0.02	0.0281	14.23	0.0001	0.03						
Ridge cappings 450 mm girth	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m	100.87	228.32	kg	2.26	228.32	0.0018	0.42	0.0000	0.00	0.0000	0.01	0.0281	6.40	0.0001	0.01						
Additional Transport - to landfill (10km)	transport, freight, lorry 3.5-7.5 metric ton, EURO3	RoW	tkm	76.97	7696.61	tkm	1.00	76.97	0.53068	40.84	0.0030851	0.24	0.0062793	0.48	8.694566	669.19	0.22901	17.63						
Sub-Totals: Materials										6423.29		107.33		170.62		90870.31		7056.88		594.90				
Use Phase: Maintenance Impact										6423.29		107.33		170.62		90870.31				7691.78				
Electricity for Heating/Cooling									ZA	kWh/a	3327.65	kWh	1.00	3327.654968	1.1186	3722.31	0.011452	38.11	0.032065	106.70	15.4220204	51319.16	0.0051195	17.04
Use Phase: Operation Impact																								
Design working life (years):									30													511.08		
USE PHASE IMPACT										118092.74		1250.58		3371.66		1630445.19				8202.85				

SANS 10400-XA House: 07 MG SIP BUILDING SYSTEM																	E ₁ : Waste Generation			
Materials					Conversion			E ₁ : Carbon Footprint		E ₂ : Acidification Potential		E ₃ : Eutrophication Potential		E ₄ : Resource Depletion		Waste from Production		Construction Waste		
Item	Ecoinvent Equivalent	Loc	Unit	Quantity	Mass [kg]	Ecoinvent unit	Conversion factor	New Value	[kg CO ₂ /unit]	[kg CO ₂ /Item]	[kg SO ₂ /unit]	[kg SO ₂ /Item]	[kg NO _x /unit]	[kg NO _x /Item]	[MJ-eq/unit]	[MJ-eq/Item]	[kg/unit]	[kg/Item]	[m ² /Item]	[kg/Item]
END-OF-LIFE PHASE																				
Foundations																				
10 MPa concrete foundation (60x200mm)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	7.32	17568.00	kg	2400.00	17568.00	0.0129	226.47	0.0001	1.90	0.00020334	3.57	0.3015	5296.36	1.0022	17606.65		
Reinforcing (4 x Y12)	treatment of waste reinforcement steel, collection for final disposal	CH	kg	68.95	68.95	kg	1.00	68.95	0.1512	10.42	0.0010	0.07	0.020793	1.43	2.1420	147.70	0.2136	14.73		
190 mm solid blockwork (foundation wall)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ²	16.00	4560.00	kg	285.00	4560.00	0.0129	58.78	0.0001	0.49	0.0002	0.93	0.3015	1374.74	1.0022	4570.03		
400x210mm strip footing	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	3.36	7392.00	kg	2200.00	7392.00	0.0129	95.29	0.0001	0.80	0.0002	1.50	0.3015	2228.52	1.0022	7408.26		
brickforce (75x2.8mm)	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m	80.00	8.72	kg	0.11	8.72	0.0018	0.02	0.0000	0.00	0.0000	0.00	0.0281	0.24	0.0001	0.00		
Floor Slab																				
Damp proof membrane 250 micron	treatment of waste polyethylene/polypropylene product, collection for final disposal	RoW	m ²	91.00	20.93	kg	0.23	20.93	0.3839	8.03	0.0001	0.00	0.0040	0.08	0.3704	7.75	0.9129	19.11		
25 MPa concrete (power floated)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	9.10	21840.00	kg	2400.00	21840.00	0.0129	281.54	0.0001	2.36	0.0002	4.44	0.3015	6584.28	1.0022	21888.05		
Steel mesh ref 193	treatment of waste reinforcement steel, collection for final disposal	CH	m ²	91.00	175.63	kg	1.93	175.63	0.1512	26.55	0.0010	0.17	0.0208	3.65	2.1420	376.19	0.2136	37.51		
External walls (125mm)																				
Expanded polystyrene core (103mm)	treatment of waste polystyrene, sanitary landfill	RoW	m ³	9.25	22198.17	kg	24.00	221.98	0.0910	20.21	0.0001	0.03	0.1915	42.51	0.3967	88.06	1.0025	222.54		
Gypsum plaster board (15mm)	treatment of waste gypsum, sanitary landfill	CH	m ³	1.35	1212.28	kg	900.00	1212.28	0.0122	14.81	0.0249	30.21	0.0002	0.29	0.3342	405.19	1.0037	1216.76		
Oriented strand board (2x11mm)	treatment of waste fibreboard, collection for final disposal	RoW	m ²	1.98	1284.12	kg	650.00	1284.12	0.0961	123.45	0.0005	0.65	0.0063	8.13	0.3406	437.36	0.0648	83.20		
Medium density fibre-cement board (12mm)	treatment of waste fibreboard, collection for final disposal	RoW	m ³	1.08	862.06	kg	800.00	862.06	0.0961	82.88	0.0005	0.44	0.0063	5.46	0.3406	293.61	0.0648	55.85		
Steel fibre base rail (127x52x2)	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m ³	0.02	144.14	kg	7800.00	144.14	0.0961	13.86	0.0005	0.07	0.0063	0.91	0.3406	49.09	0.0648	9.34		
Branding (38x38mm @300mm)	treatment of waste wood, untreated, municipal incineration	RoW	m ³	1.04	519.84	kg	500.00	519.84	0.0146	7.59	0.0002	0.08	0.0006	0.30	0.1663	86.46	0.0120	6.22		
DPC - 375micron	treatment of waste polyethylene/polypropylene product, collection for final disposal	RoW	m	40.00	1.52	kg	0.04	1.52	0.3839	0.58	0.0001	0.00	0.0040	0.01	0.3704	0.56	0.9129	1.39		
Internal Walls 90 mm																				
Solid blockwork, mortar	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ²	69.57	12869.85	kg	185.00	12869.85	0.0129	165.91	0.0001	1.39	0.0002	2.62	0.3015	3879.97	1.0022	12898.16		
Plaster, both sides (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	139.13	3840.08	kg	27.60	3840.08	0.0087	33.51	0.0001	0.26	0.0001	0.51	0.2363	907.56	1.0022	3848.53		
Ceiling and Thermal Insulation																				
6.4 mm gypsum plaster board	treatment of waste gypsum, sanitary landfill	CH	m ²	91.00	518.70	kg	5.70	518.70	0.0122	6.34	0.0249	12.93	0.0002	0.12	0.3342	173.37	1.0037	520.62		
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornices)	treatment of waste mineral wool, inert material landfill	RoW	m ²	91.00	527.80	kg	5.80	527.80	0.005503	2.90	4.74E-05	0.03	8.70E-05	0.05	0.18291267	96.54	0.99965	527.62		
Roofing																				
Howe type truss to be designed by supplier for 7 m span	treatment of waste wood, untreated, municipal incineration	RoW	m ³	1.22	609.68	kg	500.00	609.68	0.0146	8.90	0.0002	0.10	0.0006	0.36	0.1663	101.40	0.0120	7.29		
114x38 wall plate including beam filling	treatment of waste wood, untreated, municipal incineration	RoW	m ³	0.11	56.32	kg	500.00	56.32	0.0146	0.82	0.0002	0.01	0.0006	0.03	0.1663	9.37	0.0120	0.67		
50x76 mm purlins on edge at maximum 1.2 m spacing	treatment of waste wood, untreated, municipal incineration	RoW	m ³	0.40	197.60	kg	500.00	197.60	0.0146	2.89	0.0002	0.03	0.0006	0.12	0.1663	32.86	0.0120	2.36		
Roof Covering																				
0.54 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive "Znalu" based steel sheeting	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m ²	100.87	507.37	kg	5.03	507.37	0.0018	0.94	0.0000	0.01	0.0000	0.02	0.0281	14.23	0.0001	0.03		
Ridge cappings 450 mm girth	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m	13.00	29.43	kg	2.26	29.43	0.0018	0.05	0.0000	0.00	0.0000	0.00	0.0281	0.83	0.0001	0.00		
Additional Transport - to landfill (10km)	transport, freight, lorry 3.5-7.5 metric ton, EURO3	RoW	tkm	970.13	97013.19	tkm	1.00	970.13	0.53068	514.83	0.0030851	2.99	0.0062793	6.09	8.694566	8434.88	0.22901	222.17		
Sub-Totals																				
END-OF-LIFE PHASE IMPACT										1707.57		55.02		83.13		31027.13				71167.08
TOTAL LIFE CYCLE IMPACT										190197.30		1757.63		5341.80		2853436.33				97128.18

D8. EXTERNAL WALLING SYSTEM 08: BLAST BUILDING SYSTEM

SANS 10400-XA House: 08 BLAST BUILDING SYSTEM																		E ₂ Waste Generation			
Materials		Conversion				E ₁ : Carbon Footprint		E ₂ : Acidification Potential		E ₃ : Eutrophication Potential		E ₄ : Resource Depletion		Waste from Production		Construction Waste					
Item	Ecoinvent Equivalent	Loc	Unit	Quantity	Mass [kg]	Ecoinvent unit	Conversion factor	New Value	[kg CO ₂ e/unit]	[kg CO ₂ e/item]	[kg SO ₂ e/unit]	[kg SO ₂ e/item]	[kg NO _x /unit]	[kg NO _x /item]	[MJ-eq/unit]	[MJ-eq/item]	[kg/unit]	[kg/item]	[m ³ /item]	[kg/item]	
PRE-USE PHASE																					
Foundations																					
10 MPa concrete foundation (600x200mm)	concrete production, normal		RoW	m ³	7.32	17568.00	m ³	1.00	7.32	370.4100	2711.40	1.0317	7.55	2.4093	17.64	2478.2760	18140.98	36.7870	269.28	0.22	527.04
Reinforcing (4 x Y12)	reinforcing steel production; section bar rolling, steel		RoW	kg	68.95	68.95	kg	1.00	68.95	2.6337	181.61	0.0107	0.74	0.0494903	3.41	34.5065	2379.37	0.6712	46.28	0.00	3.45
190 mm solid blockwork (foundation wall)	concrete block production		RoW	m ²	16.00	4560.00	kg	285.00	4560.00	0.1807	824.08	0.0006	2.73	0.0018	8.08	1.4632	6672.04	0.0278	126.64	0.35	384.38
400x210mm strip footing	concrete block production		RoW	m ³	3.36	7392.00	kg	2200.00	7392.00	0.1807	1335.88	0.0006	4.43	0.0018	13.11	1.4632	10815.73	0.0278	205.28	0.52	1153.15
brickforce (75x2.8mm)	steel production, low-alloyed, hot rolled; wire drawing, steel		RoW	m	80.00	8.72	kg	0.11	8.72	2.6463	23.07	0.0120	0.10	0.0677	0.59	39.2618	342.21	0.9042	7.88	0.00	0.00
galvanised	zinc coating, coils		RoW	m ²	1.57		m ²	1.00	1.57	5.3066	8.32	0.30194	0.47	0.56793	0.89	106.39365	166.83	0.28081	0.44	0.00	0.00
Floor Slab																					
Damp proof membrane 250 micron	polyethylene production, low density, granulate; extrusion production, plastic film		RoW	m ²	91.00	20.93	kg	0.23	20.93	2.7305	57.15	0.0120	0.25	0.0277	0.58	83.9319	1756.70	0.0817	1.71	0.00	0.00
25 MPa concrete (power floated)	concrete production, normal		RoW	m ³	9.10	21840.00	m ³	1.00	9.10	370.4100	3370.73	1.0317	9.39	2.4093	21.92	2478.2760	22552.31	36.7870	334.76	0.27	655.20
steel mesh ref 193	reinforcing steel production; section bar rolling, steel		RoW	m ²	91.00	175.63	kg	1.93	175.63	2.6337	462.56	0.0107	1.88	0.0495	8.69	34.5065	6060.38	0.6712	117.89	0.00	8.78
External walls (90mm)																					
Sprayed concrete (90mm)	concrete production, normal		RoW	m ³	8.08	19396.46	m ³	1.00	8.08	370.4100	2993.60	1.0317	8.34	2.4093	19.47	2478.2760	20029.08	36.7870	297.31	0.27	581.89
Weldmesh (50x50x2.5mm)	reinforcing steel production; section bar rolling, steel		RoW	m ²	89.80	57.20	kg	1.57	57.20	2.6337	150.64	0.0107	0.61	0.0495	2.83	34.5065	1973.65	0.6712	38.39	0.00	2.86
Plaster, external (15mm)	4:1 ratio [silica sand production : cement production, Portland]		RoW	m ²	179.60	6196.09	kg	34.50	6196.09	0.2631	1630.04	0.0007	4.59	0.0016	9.62	1.5682	9716.79	0.0072	44.30	0.00	185.88
Magboard, internal (6mm)	magnesium oxide production		RoW	m ³	0.54	538.79	kg	1000.00	538.79	1.1278	607.65	0.0022	1.19	0.0047	2.53	5.4420	2932.10	0.0050	2.67	0.00	134.70
Zincalume base rail & top channel (90x40x1.5mm)	steel production, low-alloyed, hot rolled; sheet rolling, steel		RoW	m ³	0.01	79.56	kg	7800.00	79.56	2.5994	206.81	0.0127	1.01	0.0681	5.42	39.9104	3175.27	0.8821	70.18	0.24	7.24
galvanised	zinc coating, coils		RoW	m ²	13.60		m ²	1.00	13.60	5.3066	72.17	0.30194	4.11	0.56793	7.72	106.39365	1446.95	0.28081	3.82	0.00	0.00
DPC - 375micron	polyethylene production, low density, granulate; extrusion production, plastic film		RoW	m	40.00	1.52	kg	0.04	1.52	2.7305	4.14	0.0120	0.02	0.0277	0.04	83.9319	127.41	0.0817	0.12	0.08	0.00
Internal Walls 90 mm																					
Solid blockwork, mortar	concrete block production		RoW	m ²	69.57	12869.85	kg	185.00	12869.85	0.1807	2325.84	0.0006	7.72	0.0018	22.82	1.4632	18830.74	0.0278	357.41	0.98	1074.39
Plaster, both sides (12mm thick)	4:1 ratio [silica sand production : cement production, Portland]		RoW	m ²	139.13	3840.08	kg	27.60	3840.08	0.2631	1010.23	0.0007	2.84	0.0016	5.96	1.5682	6022.07	0.0072	27.46	0.05	115.20
Ceiling and Thermal Insulation																					
6.4 mm gypsum plaster board	gypsum plasterboard production		RoW	m ²	91.00	518.70	kg	5.70	518.70	0.3901	202.35	0.0026	1.35	0.0065	3.36	5.1088	2649.95	0.0239	12.39	0.15	129.58
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornices)	glass wool mat production		RoW	m ²	91.00	527.80	kg	5.80	527.80	2.717	1434.03	0.021513	11.35	0.064579	34.08	49.498325	26125.22	0.20576	108.60	0.00	0.00
Roofing																					
Howe type truss to be designed by supplier for 7 m span	planing, beam, softwood, air dried		RoW	m ³	1.22	609.68	m ³	1.00	1.22	105.2800	128.37	0.6861	0.84	5.8563	7.14	1666.1729	2031.66	39.9590	48.72	0.00	0.00
114x38 wall plate including beam filling	planing, beam, softwood, air dried		RoW	m ³	0.11	56.32	m ³	1.00	0.11	105.2800	11.86	0.6861	0.08	5.8563	0.66	1666.1729	187.66	39.9590	4.50	0.00	0.00
50x76 mm purlins on edge at maximum 1.2 m spacing	planing, beam, softwood, air dried		RoW	m ³	0.40	197.60	m ³	1.00	0.40	105.2800	41.61	0.6861	0.27	5.8563	2.31	1666.1729	658.47	39.9590	15.79	0.00	0.00
Roof Covering																					
0.54 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive "Zincalume" based steel sheeting	steel production, low-alloyed, hot rolled; sheet rolling, steel		RoW	m ²	100.87	507.37	kg	5.03	507.37	2.5994	1318.85	0.0127	6.42	0.0681	34.57	39.9104	20249.26	0.8821	447.57	0.00	47.04
Ridge cappings 450 mm girth	zinc coating, coils		RoW	m ²	100.87		m ²	1.00	100.87	5.3066	535.27	0.30194	30.46	0.56793	57.29	106.3937	10731.77	0.2808	28.32	0.00	0.00
galvanised	steel production, low-alloyed, hot rolled; sheet rolling, steel		RoW	m	13.00	29.43	kg	2.26	29.43	2.5994	76.49	0.0127	0.37	0.0681	2.01	39.9104	1174.38	0.8821	25.96	0.00	0.00
	zinc coating, coils		RoW	m ²	5.85		m ²	1.00	5.85	5.3066	31.04	0.30194	1.77	0.56793	3.32	106.3937	622.40	0.2808	1.64	0.00	0.00
Additional Transport - from factory (100km)																					
transport, freight, lorry 3.5-7.5 metric ton, EURO3			RoW	tkm	9706.07	97060.67	tkm	1.00	9706.07	0.53068	5150.82	0.0030851	29.94	0.0062793	60.95	8.694566	84390.04	0.22901	2222.79		
Additional Transport - to landfill (10km)																					
transport, freight, lorry 3.5-7.5 metric ton, EURO3			RoW	tkm	50.11		tkm	1.00	50.11	0.53068	26.59	0.0030851	0.15	0.0062793	0.31	8.694566	435.67	0.22901	11.48		5010.79
Sub-Totals																					
										26933.19		140.97		357.35		282397.06		4879.59		9890.38	
PRE-USE PHASE IMPACT																					

SANS 10400-XA House: 08 BLAST BUILDING SYSTEM																	E ₂ : Waste Generation				
Item	Materials			Conversion				E ₁ : Carbon Footprint		E ₂ : Acidification Potential		E ₃ : Eutrophication Potential		E ₄ : Resource Depletion		Waste from Production		Construction Waste			
	Ecoinvent Equivalent	Loc	Unit	Quantity	Mass [kg]	Ecoinvent unit	Conversion factor	New Value	[kg CO ₂ e/unit]	[kg CO ₂ e/item]	[kg SO ₂ e/unit]	[kg SO ₂ e/item]	[kg NO _x e/unit]	[kg NO _x e/item]	[MJ-eq/unit]	[MJ-eq/item]	[kg/unit]	[kg/item]	[m ³ /item]	[kg/item]	
USE PHASE																					
REPLACEMENT OF PARTS																					
External walls (90mm)																					
Plaster, external (15mm)	4:1 ratio [silica sand production : cement production, Portland]	RoW	m ²	179.60	6196.09	kg	34.50	6196.09	0.26	1630.04	0.00	4.59	0.00	9.62	1.57	9716.79	0.01	44.30	0.08	185.88	
Magboard, internal (6mm)	magnesium oxide production	RoW	m ³	0.54	538.79	kg	1000.00	538.79	1.13	607.65	0.00	1.19	0.00	2.53	5.44	2932.10	0.00	2.67	0.13	134.70	
Internal Walls 90 mm																					
Plaster, both sides (12mm thick)	4:1 ratio [silica sand production : cement production, Portland]	RoW	m ²	139.13	3840.08	kg	27.60	3840.08	0.2631	1010.23	0.0007	2.84	0.0016	5.96	1.5682	6022.07	0.0072	27.46	0.05	115.20	
Ceiling and Thermal Insulation																					
6.4 mm gypsum plaster board	gypsum plasterboard production	RoW	m ²	91.00	518.70	kg	5.70	518.70	0.3901	202.35	0.0026	1.35	0.0065	3.36	5.1088	2649.95	0.0239	12.39	0.15	129.58	
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornices)	glass wool mat production	RoW	m ²	91.00	527.80	kg	5.80	527.80	2.717	1434.03	0.021513	11.35	0.064579	34.08	49.498325	26125.22	0.20576	108.60	0.00	0.00	
Roof Covering																					
0.54 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive "Zincalume" based steel sheeting	steel production, low-alloyed, hot rolled; sheet rolling, steel	RoW	m ²	100.87	507.37	kg	5.03	507.37	2.5994	1318.85	0.0127	6.42	0.0681	34.57	39.9104	20249.26	0.8821	447.57	0.00	47.04	
Ridge cappings 450 mm girth	zinc coating, coils	RoW	m ²	100.87		m ²	1.00	100.87	5.3066	535.27	0.30194	30.46	0.56793	57.29	106.3937	10731.77	0.2808	28.32	0.00	0.00	
galvanised	steel production, low-alloyed, hot rolled; sheet rolling, steel	RoW	m	13.00	29.43	kg	2.26	29.43	2.5994	76.49	0.0127	0.37	0.0681	2.01	39.9104	1174.38	0.8821	25.96	0.00	0.00	
	zinc coating, coils	RoW	m ²	5.85		m ²	1.00	5.85	5.3066	31.04	0.30194	1.77	0.56793	3.32	106.3937	622.40	0.2808	1.64	0.00	0.00	
Additional Transport - from factory (100km)																					
	transport, freight, lorry 3.5-7.5 metric ton, EURO3	RoW	tkm	1215.83	12158.26	tkm	1.00	1215.83	0.53068	645.21	0.0030851	3.75	0.0062793	7.63	8.694566	10571.08	0.22901	278.44			
Additional Transport - to landfill (10km)																					
	transport, freight, lorry 3.5-7.5 metric ton, EURO3	RoW	tkm	6.12		tkm	1.00	6.12	0.53068	3.25	0.0030851	0.02	0.0062793	0.04	8.694566	53.25	0.22901	1.40			
DISPOSAL OF OLD PARTS																					
External walls (90mm)																					
Plaster, external (15mm)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	179.60	6196.09	kg	34.50	6196.09	0.0087	54.06	0.0001	0.43	0.0001	0.82	0.2363	1464.37	1.0022	6209.72			
Magboard, internal (6mm)	treatment of waste fibreboard, collection for final disposal	RoW	m ³	0.54	538.79	kg	1000.00	538.79	0.0961	51.80	0.0005	0.27	0.0063	3.41	0.3406	183.51	0.0648	34.91			
Internal Walls 90 mm																					
Plaster, both sides (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	139.13	3840.08	kg	27.60	3840.08	0.0087	33.51	0.0001	0.26	0.0001	0.51	0.2363	907.56	1.0022	3848.53			
Ceiling and Thermal Insulation																					
6.4 mm gypsum plaster board	treatment of waste gypsum, sanitary landfill	CH	m ²	91.00	518.70	kg	5.70	518.70	0.0122	6.34	0.0249	12.93	0.0002	0.12	0.3342	173.37	1.0037	520.62			
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornices)	treatment of waste mineral wool, inert material landfill	RoW	m ²	91.00	527.80	kg	5.80	527.80	0.0055	2.90	0.0000	0.03	0.0001	0.05	0.1829	96.54	0.9997	527.62			
Roof Covering																					
0.54 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive "Zincalume" based steel sheeting	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m ²	100.87	507.37	kg	5.03	507.37	0.0018	0.94	0.0000	0.01	0.0000	0.02	0.0281	14.23	0.0001	0.03			
Ridge cappings 450 mm girth	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m	100.87	228.32	kg	2.26	228.32	0.0018	0.42	0.0000	0.00	0.0000	0.01	0.0281	6.40	0.0001	0.01			
Additional Transport - to landfill (10km)																					
	transport, freight, lorry 3.5-7.5 metric ton, EURO3	RoW	tkm	123.57	12357.15	tkm	1.00	123.57	0.53068	65.58	0.0030851	0.38	0.0062793	0.78	8.694566	1074.40	0.22901	28.30			
Sub-Totals: Materials																					
								7709.96		78.41		78.41		166.13		94768.64		12148.48		612.41	
Use Phase: Maintenance Impact																					
Number of maintenance cycles:				1																	
Electricity for Heating/Cooling																					
electricity production, hard coal		ZA	kWh/a	6746.44			kWh	1.00	6746.438773	1.1186	7546.57	0.011452	77.26	0.032065	216.32	15.4220204	104043.72	0.0051195	34.54		
Use Phase: Operation Impact																					
Design working life (years):				30																	
USE PHASE IMPACT																					
									234106.95		2396.22		6655.87		3216080.14					13797.04	

SANS 10400-XA House: 08 BLAST BUILDING SYSTEM																	E ₂ : Waste Generation			
Item	Materials			Conversion				E ₁ : Carbon Footprint		E ₂ : Acidification Potential		E ₃ : Eutrophication Potential		E ₄ : Resource Depletion		Waste from Production		Construction Waste		
	Ecoinvent Equivalent	Loc	Unit	Quantity	Mass [kg]	Ecoinvent unit	Conversion factor	New Value	[kg CO ₂ e/unit]	[kg CO ₂ e/item]	[kg SO ₂ e/unit]	[kg SO ₂ e/item]	[kg NO _x e/unit]	[kg NO _x e/item]	[MJ-eq/unit]	[MJ-eq/item]	[kg/unit]	[kg/item]	[m ³ /item]	[kg/item]
END-OF-LIFE PHASE																				
Foundations																				
10 MPa concrete foundation (600x200mm)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	7.32	17568.00	kg	2400.00	17568.00	0.0129	226.47	0.0001	1.90	0.00020334	3.57	0.3015	5296.36	1.0022	17606.65		
Reinforcing (4 x Y12)	treatment of waste reinforcement steel, collection for final disposal	CH	kg	68.95	68.95	kg	1.00	68.95	0.1512	10.42	0.0010	0.07	0.020793	1.43	2.1420	147.70	0.2136	14.73		
190 mm solid blockwork (foundation wall)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	16.00	4560.00	kg	285.00	4560.00	0.0129	58.78	0.0001	0.49	0.0002	0.93	0.3015	1374.74	1.0022	4570.03		
400x210mm strip footing	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	3.36	7392.00	kg	2200.00	7392.00	0.0129	95.29	0.0001	0.80	0.0002	1.50	0.3015	2228.52	1.0022	7408.26		
brickforce (75x2.8mm)	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m	80.00	8.72	kg	0.11	8.72	0.0018	0.02	0.0000	0.00	0.0000	0.00	0.0281	0.24	0.0001	0.00		
										0.00		0.00				0.00		0.00		
										0.00		0.00				0.00		0.00		
Floor Slab																				
Damp proof membrane 250 micron	treatment of waste polyethylene/polypropylene product, collection for final disposal	RoW	m ²	91.00	20.93	kg	0.23	20.93	0.3839	8.03	0.0001	0.00	0.0040	0.08	0.3704	7.75	0.9129	19.11		
25 MPa concrete (power floated)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	9.10	21840.00	kg	2400.00	21840.00	0.0129	281.54	0.0001	2.36	0.0002	4.44	0.3015	6584.28	1.0022	21888.05		
steel mesh ref 193	treatment of waste reinforcement steel, collection for final disposal	CH	m ²	91.00	175.63	kg	1.93	175.63	0.1512	26.55	0.0010	0.17	0.0208	3.65	2.1420	376.19	0.2136	37.51		
										0.00		0.00				0.00		0.00		
External walls (90mm)																				
Sprayed concrete (90mm)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	8.08	19396.46	kg	2400.00	19396.46	0.0129	250.04	0.0001	2.09	0.0002	3.94	0.3015	5847.60	1.0022	19439.13		
Weldmesh (50x50x2.5mm)	treatment of waste reinforcement steel, collection for final disposal	CH	m ²	89.80	57.20	kg	1.57	57.20	0.1512	8.65	0.0010	0.06	0.0208	1.19	2.1420	122.51	0.2136	12.21		
Plaster, external (15mm)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	179.60	6196.09	kg	34.50	6196.09	0.0087	54.06	0.0001	0.43	0.0001	0.82	0.2363	1464.37	1.0022	6209.72		
Magboard, internal (6mm)	treatment of waste fibreboard, collection for final disposal	RoW	m ³	0.54	538.79	kg	1000.00	538.79	0.0961	51.80	0.0005	0.27	0.0063	3.41	0.3406	183.51	0.0648	34.91		
Zincalume base rail & top channel (90x40x1.5mm)	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m ³	0.01	79.56	kg	7800.00	79.56	0.0018	0.15	0.0000	0.00	0.0000	0.00	0.0281	2.23	0.0001	0.00		
DPC - 375micron	treatment of waste polyethylene/polypropylene product, collection for final disposal	RoW	m	40.00	1.52	kg	0.04	1.52	0.3839	0.58	0.0001	0.00	0.0040	0.01	0.3704	0.56	0.9129	1.39		
Internal Walls 90 mm																				
Solid blockwork, mortar	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ²	69.57	12869.85	kg	185.00	12869.85	0.0129	165.91	0.0001	1.39	0.0002	2.62	0.3015	3879.97	1.0022	12898.16		
Plaster, both sides (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	139.13	3840.08	kg	27.60	3840.08	0.0087	33.51	0.0001	0.26	0.0001	0.51	0.2363	907.56	1.0022	3848.53		
Ceiling and Thermal Insulation																				
6.4 mm gypsum plaster board	treatment of waste gypsum, sanitary landfill	CH	m ²	91.00	518.70	kg	5.70	518.70	0.0122	6.34	0.0249	12.93	0.0002	0.12	0.3342	173.37	1.0037	520.62		
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornices)	treatment of waste mineral wool, inert material landfill	RoW	m ²	91.00	527.80	kg	5.80	527.80	0.005503	2.90	4.74E-05	0.03	8.70E-05	0.05	0.18291267	96.54	0.99965	527.62		
Roofing																				
Howe type truss to be designed by supplier for 7 m span	treatment of waste wood, untreated, municipal incineration	RoW	m ³	1.22	609.68	kg	500.00	609.68	0.0146	8.90	0.0002	0.10	0.0006	0.36	0.1663	101.40	0.0120	7.29		
114x38 wall plate including beam filling	treatment of waste wood, untreated, municipal incineration	RoW	m ³	0.11	56.32	kg	500.00	56.32	0.0146	0.82	0.0002	0.01	0.0006	0.03	0.1663	9.37	0.0120	0.67		
50x76 mm purlins on edge at maximum 1.2 m spacing	treatment of waste wood, untreated, municipal incineration	RoW	m ³	0.40	197.60	kg	500.00	197.60	0.0146	2.89	0.0002	0.03	0.0006	0.12	0.1663	32.86	0.0120	2.36		
Roof Covering																				
0.54 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive "Zincalume" based steel sheeting	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m ²	100.87	507.37	kg	5.03	507.37	0.0018	0.94	0.0000	0.01	0.0000	0.02	0.0281	14.23	0.0001	0.03		
Ridge cappings 450 mm girth	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m	13.00	29.43	kg	2.26	29.43	0.0018	0.05	0.0000	0.00	0.0000	0.00	0.0281	0.83	0.0001	0.00		
Additional Transport - to landfill (10km)																				
Sub-Totals	transport, freight, lorry 3.5-7.5 metric ton, EURO3	RoW	tkm	970.61	97060.67	tkm	1.00	970.61	0.53068	515.08	0.0030851	2.99	0.0062793	6.09	8.694566	8439.00	0.22901	222.28		95269.26
END-OF-LIFE PHASE IMPACT										1809.72		26.38		34.90		37291.72				95269.26
TOTAL LIFE CYCLE IMPACT										262849.86		2563.56		7048.12		3535768.92				118956.68

D9. EXTERNAL WALLING SYSTEM 09: IKHAYA FUTURE HOUSE BUILDING SYSTEM

SANS 10400-XA House: 09 Ikhaya Future House																	E ₁ : Waste Generation			
Materials		Conversion			E ₁ : Carbon Footprint		E ₂ : Acidification Potential		E ₃ : Eutrophication Potential		E ₄ : Resource Depletion		Waste from Production		Construction Waste					
Item	Ecoinvent Equivalent	Loc	Unit	Quantity	Mass [kg]	Ecoinvent unit	Conversion factor	New Value	[kg CO _{2e} /unit]	[kg CO _{2e} /item]	[kg SO _{2e} /unit]	[kg SO _{2e} /item]	[kg NO _x /unit]	[kg NO _x /item]	[MJ-eq/unit]	[MJ-eq/item]	[kg/unit]	[kg/item]	[m ³ /item]	[kg/item]
PRE-USE PHASE																				
Foundations																				
10 MPa concrete foundation (600x200mm)	concrete production, normal																			
		RoW	m ³	7.32	17568.00	m ³	1.00	7.32	370.4100	2711.40	1.0317	7.55	2.4093	17.64	2478.2760	18140.98	36.7870	269.28	0.22	527.04
Reinforcing (4 x Y12)	reinforcing steel production; section bar rolling, steel	RoW	kg	68.95	68.95	kg	1.00	68.95	2.6337	181.61	0.0107	0.74	0.0494903	3.41	34.5065	2379.37	0.6712	46.28	0.00	3.45
190 mm solid blockwork (foundation wall)	concrete block production	RoW	m ²	16.00	4560.00	kg	285.00	4560.00	0.1807	824.08	0.0006	2.73	0.0018	8.08	1.4632	6672.04	0.0278	126.64	0.35	384.38
400x210mm strip footing	concrete block production	RoW	m ³	3.36	7392.00	kg	2200.00	7392.00	0.1807	1335.88	0.0006	4.43	0.0018	13.11	1.4632	10815.73	0.0278	205.28	0.52	1153.15
brickforce (75x2.8mm)	steel production, low-alloyed, hot rolled; wire drawing, steel	RoW	m	80.00	8.72	kg	0.11	8.72	2.6463	23.07	0.0120	0.10	0.0677	0.59	39.2618	342.21	0.9042	7.88	0.00	0.00
galvanised	zinc coating, coils	RoW	m ²	1.57		m ²	1.00	1.57	5.3066	8.32	0.30194	0.47	0.56793	0.89	106.39365	166.83	0.28081	0.44	0.00	0.00
Floor Slab																				
Damp proof membrane 250 micron	polyethylene production, low density, granulate; extrusion production, plastic film	RoW	m ²	91.00	20.93	kg	0.23	20.93	2.7305	57.15	0.0120	0.25	0.0277	0.58	83.9319	1756.70	0.0817	1.71	0.00	0.00
25 MPa concrete (power floated)	concrete production, normal	RoW	m ³	9.10	21840.00	m ³	1.00	9.10	370.4100	3370.73	1.0317	9.39	2.4093	21.92	2478.2760	22552.31	36.7870	334.76	0.27	655.20
steel mesh ref 193	reinforcing steel production; section bar rolling, steel	RoW	m ²	91.00	175.63	kg	1.93	175.63	2.6337	462.56	0.0107	1.88	0.0495	8.69	34.5065	6060.38	0.6712	117.89	0.00	8.78
External walls (160mm)																				
Expanded polystyrene core (80mm)	polystyrene production, expandable	RoW	m ³	7.18	17241.30	kg	16.00	114.94	3.3406	383.98	0.0105	1.21	0.0105	1.21	92.8484	10672.18	0.0648	7.45	0.27	28.74
Weldmesh, both sides (100x100x3.5mm)	reinforcing steel production; section bar rolling, steel	RoW	m ²	179.60	280.17	kg	1.56	280.17	2.6337	737.89	0.0107	2.99	0.0495	13.87	34.5065	9667.72	0.6712	188.06	0.00	14.01
Plaster, both sides (40mm)	4:1 ratio [silica sand production : cement production, Portland]	RoW	m ²	179.60	16522.91	kg	92.00	16522.91	0.2631	4346.77	0.0007	12.23	0.0016	25.66	1.5682	25911.43	0.0072	118.14	0.00	185.88
DPC - 375micron	polyethylene production, low density, granulate; extrusion production, plastic film	RoW	m	40.00	1.52	kg	0.04	1.52	2.7305	4.14	0.0120	0.02	0.0277	0.04	83.9319	127.41	0.0817	0.12	0.08	0.00
Internal Walls 90 mm																				
Solid blockwork, mortar	concrete block production	RoW	m ²	69.57	12869.85	kg	185.00	12869.85	0.1807	2325.84	0.0006	7.72	0.0018	22.82	1.4632	18830.74	0.0278	357.41	0.98	1074.39
Plaster, both sides (12mm thick)	4:1 ratio [silica sand production : cement production, Portland]	RoW	m ²	139.13	3840.08	kg	27.60	3840.08	0.2631	1010.23	0.0007	2.84	0.0016	5.96	1.5682	6022.07	0.0072	27.46	0.05	115.20
Ceiling and Thermal Insulation																				
6.4 mm gypsum plaster board	gypsum plasterboard production	RoW	m ²	91.00	518.70	kg	5.70	518.70	0.3901	202.35	0.0026	1.35	0.0065	3.36	5.1088	2649.95	0.0239	12.39	0.15	129.58
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornices)	glass wool mat production	RoW	m ²	91.00	527.80	kg	5.80	527.80	2.717	1434.03	0.021513	11.35	0.064579	34.08	49.498325	26125.22	0.20576	108.60	0.00	0.00
Roofing																				
Howe type truss to be designed by supplier for 7 m span	planing, beam, softwood, air dried	RoW	m ³	1.22	609.68	m ³	1.00	1.22	105.2800	128.37	0.6861	0.84	5.8563	7.14	1666.1729	2031.66	39.9590	48.72	0.00	0.00
114x38 wall plate including beam filling	planing, beam, softwood, air dried	RoW	m ³	0.11	56.32	m ³	1.00	0.11	105.2800	11.86	0.6861	0.08	5.8563	0.66	1666.1729	187.66	39.9590	4.50	0.00	0.00
50x76 mm purlins on edge at maximum 1.2 m spacing	planing, beam, softwood, air dried	RoW	m ³	0.40	197.60	m ³	1.00	0.40	105.2800	41.61	0.6861	0.27	5.8563	2.31	1666.1729	658.47	39.9590	15.79	0.00	0.00
Roof Covering																				
0.54 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive	steel production, low-alloyed, hot rolled; sheet rolling, steel	RoW	m ²	100.87	507.37	kg	5.03	507.37	2.5994	1318.85	0.0127	6.42	0.0681	34.57	39.9104	20249.26	0.8821	447.57	0.00	47.04
"Zincalume" based steel sheeting	zinc coating, coils	RoW	m ²	100.87		m ²	1.00	100.87	5.3066	535.27	0.30194	30.46	0.56793	57.29	106.3937	10731.77	0.2808	28.32	0.00	0.00
Ridge cappings 450 mm girth	steel production, low-alloyed, hot rolled; sheet rolling, steel	RoW	m	13.00	29.43	kg	2.26	29.43	2.5994	76.49	0.0127	0.37	0.0681	2.01	39.9104	1174.28	0.8821	25.96	0.00	0.00
galvanised	zinc coating, coils	RoW	m ²	5.85		m ²	1.00	5.85	5.3066	31.04	0.30194	1.77	0.56793	3.32	106.3937	622.40	0.2808	1.64	0.00	0.00
Additional Transport - from factory (100km)																				
Additional Transport - to landfill (10km)	transport, freight, lorry 3.5-7.5 metric ton, EURO3	RoW	tkm	10483.69	10483.69	tkm	1.00	10483.69	0.53068	5563.49	0.0030851	32.34	0.0062793	65.83	8.694566	91151.18	0.22901	2400.87		
Sub-Totals	transport, freight, lorry 3.5-7.5 metric ton, EURO3	RoW	tkm	43.27		tkm	1.00	43.27	0.53068	22.96	0.0030851	0.13	0.0062793	0.27	8.694566	376.20	0.22901	9.91		4326.85
PRE-USE PHASE IMPACT										27149.96		139.94		355.32		296076.24		4913.09		9239.93

SANS 10400-XA House: 09 Ikhaya Future House																	E ₁ : Waste Generation			
Materials					Conversion			E ₁ : Carbon Footprint		E ₂ : Acidification Potential		E ₃ : Eutrophication Potential		E ₄ : Resource Depletion		Waste from Production		Construction Waste		
Item	Ecoinvent Equivalent	Loc	Unit	Quantity	Mass [kg]	Ecoinvent unit	Conversion factor	New Value	[kg CO ₂ /unit]	[kg CO ₂ /item]	[kg SO ₂ /unit]	[kg SO ₂ /item]	[kg NO _x /unit]	[kg NO _x /item]	[MJ-eq/unit]	[MJ-eq/item]	[kg/unit]	[kg/item]	[m ³ /item]	[kg/item]
USE PHASE																				
REPLACEMENT OF PARTS																				
External walls (160mm)																				
Plaster, both sides (40mm)	4:1 ratio [silica sand production : cement production, Portland]	RoW	m ²	179.60	16522.91	kg	92.00	16522.91	0.26	4346.77	0.00	12.23	0.00	25.66	1.57	25911.43	0.01	118.14	0.08	185.88
Internal Walls 90 mm																				
Plaster, both sides (12mm thick)	4:1 ratio [silica sand production : cement production, Portland]	RoW	m ²	139.13	3840.08	kg	27.60	3840.08	0.2631	1010.23	0.0007	2.84	0.0016	5.96	1.5682	6022.07	0.0072	27.46	0.05	115.20
Ceiling and Thermal Insulation																				
6.4 mm gypsum plaster board	gypsum plasterboard production	RoW	m ²	91.00	518.70	kg	5.70	518.70	0.3901	202.35	0.0026	1.35	0.0065	3.36	5.1088	2649.95	0.0239	12.39	0.15	129.58
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornices)	glass wool mat production	RoW	m ²	91.00	527.80	kg	5.80	527.80	2.717	1434.03	0.021513	11.35	0.064579	34.08	49.498325	26125.22	0.20576	108.60	0.00	0.00
Roof Covering																				
0.54 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive "Zincalume" based steel sheeting	steel production, low-alloyed, hot rolled; sheet rolling, steel	RoW	m ²	100.87	507.37	kg	5.03	507.37	2.5994	1318.85	0.0127	6.42	0.0681	34.57	39.9104	20249.26	0.8821	447.57	0.00	47.04
Ridge cappings 450 mm girth	zinc coating, coils	RoW	m ²	100.87	507.37	m ²	1.00	100.87	5.3066	535.27	0.30194	30.46	0.56793	57.29	106.3937	10731.77	0.2808	28.32	0.00	0.00
galvanised	steel production, low-alloyed, hot rolled; sheet rolling, steel	RoW	m	13.00	29.43	kg	2.26	29.43	2.5994	76.49	0.0127	0.37	0.0681	2.01	39.9104	1174.38	0.8821	25.96	0.00	0.00
Additional Transport - from factory (100km)	zinc coating, coils	RoW	m ²	5.85	5.85	m ²	1.00	5.85	5.3066	31.04	0.30194	1.77	0.56793	3.32	106.3937	622.40	0.2808	1.64	0.00	0.00
Additional Transport - to landfill (10km)	transport, freight, lorry 3.5-7.5 metric ton, EURO3	RoW	tkm	2194.63	21946.29	tkm	1.00	2194.63	0.53068	1164.65	0.0030851	6.77	0.0062793	13.78	8.694566	19081.35	0.22901	502.59		
Additional Transport - to landfill (10km)	transport, freight, lorry 3.5-7.5 metric ton, EURO3	RoW	tkm	4.78	4.78	tkm	1.00	4.78	0.53068	2.54	0.0030851	0.01	0.0062793	0.03	8.694566	41.53	0.22901	1.09		
DISPOSAL OF OLD PARTS																				
External walls (160mm)																				
Plaster, both sides (40mm)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	179.60	16522.91	kg	92.00	16522.91	0.0087	144.17	0.0001	1.13	0.0001	2.18	0.2363	3904.99	1.0022	16559.26		
Internal Walls 90 mm																				
Plaster, both sides (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	139.13	3840.08	kg	27.60	3840.08	0.0087	33.51	0.0001	0.26	0.0001	0.51	0.2363	907.56	1.0022	3848.53		
Ceiling and Thermal Insulation																				
6.4 mm gypsum plaster board	treatment of waste gypsum, sanitary landfill	CH	m ²	91.00	518.70	kg	5.70	518.70	0.0122	6.34	0.0249	12.93	0.0002	0.12	0.3342	173.37	1.0037	520.62		
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (incl cornices)	treatment of waste mineral wool, inert material landfill	RoW	m ²	91.00	527.80	kg	5.80	527.80	0.0055	2.90	0.0000	0.03	0.0001	0.05	0.1829	96.54	0.9997	527.62		
Roof Covering																				
0.54 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive "Zincalume" based steel sheeting	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m ²	100.87	507.37	kg	5.03	507.37	0.0018	0.94	0.0000	0.01	0.0000	0.02	0.0281	14.23	0.0001	0.03		
Ridge cappings 450 mm girth	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m	100.87	228.32	kg	2.26	228.32	0.0018	0.42	0.0000	0.00	0.0000	0.01	0.0281	6.40	0.0001	0.01		
Additional Transport - to landfill (10km)	transport, freight, lorry 3.5-7.5 metric ton, EURO3	RoW	tkm	221.45	22145.18	tkm	1.00	221.45	0.53068	117.52	0.0030851	0.68	0.0062793	1.39	8.694566	1925.43	0.22901	50.71		
Sub-Totals: Materials									10428.01		88.62		184.34		119637.89		22780.55		477.71	
Use Phase: Maintenance Impact									10428.01		88.62		184.34		119637.89				23258.25	
Electricity for Heating/Cooling	electricity production, hard coal	ZA	kWh/a	3527.78		kWh	1.00	3527.780015	1.1186	3946.17	0.011452	40.40	0.032065	113.12	15.4220204	54405.50	0.0051195	18.06		
Use Phase: Operation Impact									118385.24		1212.00		3393.55		1632164.86				541.81	
Design working life (years): 30																				
USE PHASE IMPACT									128813.25		1300.62		3577.89		1751802.75				23800.07	

SANS 10400-XA House: 09 Ikhaya Future House																	E ₁ : Waste Generation			
Item	Materials				Conversion			E ₁ : Carbon Footprint		E ₂ : Acidification Potential		E ₃ : Eutrophication Potential		E ₄ : Resource Depletion		Waste from Production		Construction Waste		
	EcoInvent Equivalent	Loc	Unit	Quantity	Mass [kg]	EcoInvent unit	Conversion factor	New Value	[kg CO ₂ e/unit]	[kg CO ₂ e/item]	[kg SO ₂ e/unit]	[kg SO ₂ e/item]	[kg NO _x /unit]	[kg NO _x /item]	[MJ-eq/unit]	[MJ-eq/item]	[kg/unit]	[kg/item]	[m ³ /item]	[kg/item]
END-OF-LIFE PHASE																				
Foundations																				
10 MPa concrete foundation (600x200mm)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	7.32	17568.00	kg	2400.00	17568.00	0.0129	226.47	0.0001	1.90	0.00020334	3.57	0.3015	5296.36	1.0022	17606.65		
Reinforcing (4 x Y12)	treatment of waste reinforcement steel, collection for final disposal	CH	kg	68.95	68.95	kg	1.00	68.95	0.1512	10.42	0.0010	0.07	0.020793	1.43	2.1420	147.70	0.2136	14.73		
190 mm solid blockwork (foundation wall)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ²	16.00	4560.00	kg	285.00	4560.00	0.0129	58.78	0.0001	0.49	0.0002	0.93	0.3015	1374.74	1.0022	4570.03		
400x210mm strip footing	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	3.36	7392.00	kg	2200.00	7392.00	0.0129	95.29	0.0001	0.80	0.0002	1.50	0.3015	2228.52	1.0022	7408.26		
brickforce (75x2.8mm)	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m	80.00	8.72	kg	0.11	8.72	0.0018	0.02	0.0000	0.00	0.0000	0.00	0.0281	0.24	0.0001	0.00		
										0.00		0.00				0.00		0.00		
										0.00		0.00				0.00		0.00		
Floor Slab																				
Damp proof membrane 250 micron	treatment of waste polyethylene/polypropylene product, collection for final disposal	RoW	m ²	91.00	20.93	kg	0.23	20.93	0.3839	8.03	0.0001	0.00	0.0040	0.08	0.3704	7.75	0.9129	19.11		
25 MPa concrete (power floated)	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ³	9.10	21840.00	kg	2400.00	21840.00	0.0129	281.54	0.0001	2.36	0.0002	4.44	0.3015	6584.28	1.0022	21888.05		
steel mesh ref 193	treatment of waste reinforcement steel, collection for final disposal	CH	m ²	91.00	175.63	kg	1.93	175.63	0.1512	26.55	0.0010	0.17	0.0208	3.65	2.1420	376.19	0.2136	37.51		
										0.00		0.00				0.00		0.00		
										0.00		0.00				0.00		0.00		
External walls (160mm)																				
Expanded polystyrene core (80mm)	treatment of waste expanded polystyrene, municipal incineration	RoW	m ³	7.18	114.94	kg	16.00	114.94	3.1735	364.77	0.0004	0.05	0.0010	0.11	0.4013	46.12	0.0319	3.67		
Weldmesh, both sides (100x100x3.5mm)	treatment of waste reinforcement steel, collection for final disposal	CH	m ²	179.60	280.17	kg	1.56	280.17	0.1512	42.36	0.0010	0.27	0.0208	5.83	2.1420	600.12	0.2136	59.83		
Plaster, both sides (40mm)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	179.60	16522.91	kg	92.00	16522.91	0.0087	144.17	0.0001	1.13	0.0001	2.18	0.2363	3904.99	1.0022	16559.26		
DPC - 375micron	treatment of waste polyethylene/polypropylene product, collection for final disposal	RoW	m	40.00	1.52	kg	0.04	1.52	0.3839	0.58	0.0001	0.00	0.0040	0.01	0.3704	0.56	0.9129	1.39		
Internal Walls 90 mm																				
Solid blockwork, mortar	treatment of waste cement in concrete and mortar, collection for final disposal	RoW	m ²	69.57	12869.85	kg	185.00	12869.85	0.0129	165.91	0.0001	1.39	0.0002	2.62	0.3015	3879.97	1.0022	12898.16		
Plaster, both sides (12mm thick)	treatment of waste mineral plaster, collection for final disposal	CH	m ²	139.13	3840.08	kg	27.60	3840.08	0.0087	33.51	0.0001	0.26	0.0001	0.51	0.2363	907.56	1.0022	3848.53		
										0.00		0.00				0.00		0.00		
Ceiling and Thermal Insulation																				
6.4 mm gypsum plaster board	treatment of waste gypsum, sanitary landfill	CH	m ²	91.00	518.70	kg	5.70	518.70	0.0122	6.34	0.0249	12.93	0.0002	0.12	0.3342	173.37	1.0037	520.62		
145 mm glass wool laid to manufacturers specifications, finished with coverstrips (Incl cornices)	treatment of waste mineral wool, inert material landfill	RoW	m ²	91.00	527.80	kg	5.80	527.80	0.005503	2.90	4.74E-05	0.03	8.70E-05	0.05	0.18291267	96.54	0.99965	527.62		
Roofing																				
Howe type truss to be designed by supplier for 7 m span	treatment of waste wood, untreated, municipal incineration	RoW	m ³	1.22	609.68	kg	500.00	609.68	0.0146	8.90	0.0002	0.10	0.0006	0.36	0.1663	101.40	0.0120	7.29		
114x38 wall plate including beam filling	treatment of waste wood, untreated, municipal incineration	RoW	m ³	0.11	56.32	kg	500.00	56.32	0.0146	0.82	0.0002	0.01	0.0006	0.03	0.1663	9.37	0.0120	0.67		
50x76 mm purlins on edge at maximum 1.2 m spacing	treatment of waste wood, untreated, municipal incineration	RoW	m ³	0.40	197.60	kg	500.00	197.60	0.0146	2.89	0.0002	0.03	0.0006	0.12	0.1663	32.86	0.0120	2.36		
Roof Covering																				
0.54 mm Fielders corrugated Colorbond G550 AZ150 anti-corrosive "Zincalume" based steel sheeting	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m ²	100.87	507.37	kg	5.03	507.37	0.0018	0.94	0.0000	0.01	0.0000	0.02	0.0281	14.23	0.0001	0.03		
Ridge cappings 450 mm girth	treatment of waste bulk iron, excluding reinforcement, sorting plant	RoW	m	13.00	29.43	kg	2.26	29.43	0.0018	0.05	0.0000	0.00	0.0000	0.00	0.0281	0.83	0.0001	0.00		
Additional Transport - to landfill (10km)																				
transport, freight, lorry 3.5-7.5 metric ton, EURO3		RoW	tkm	877.11	87710.59	tkm	1.00	877.11	0.53068	465.46	0.0030851	2.71	0.0062793	5.51	8.694566	7626.06	0.22901	200.87		
Sub-Totals																		86174.63		
END-OF-LIFE PHASE IMPACT										1946.70		24.69		33.06		33409.77				86174.63
TOTAL LIFE CYCLE IMPACT											157909.91		1465.25		3966.28		2081288.76			119214.63

D10. COMPARATIVE EI RESULTS

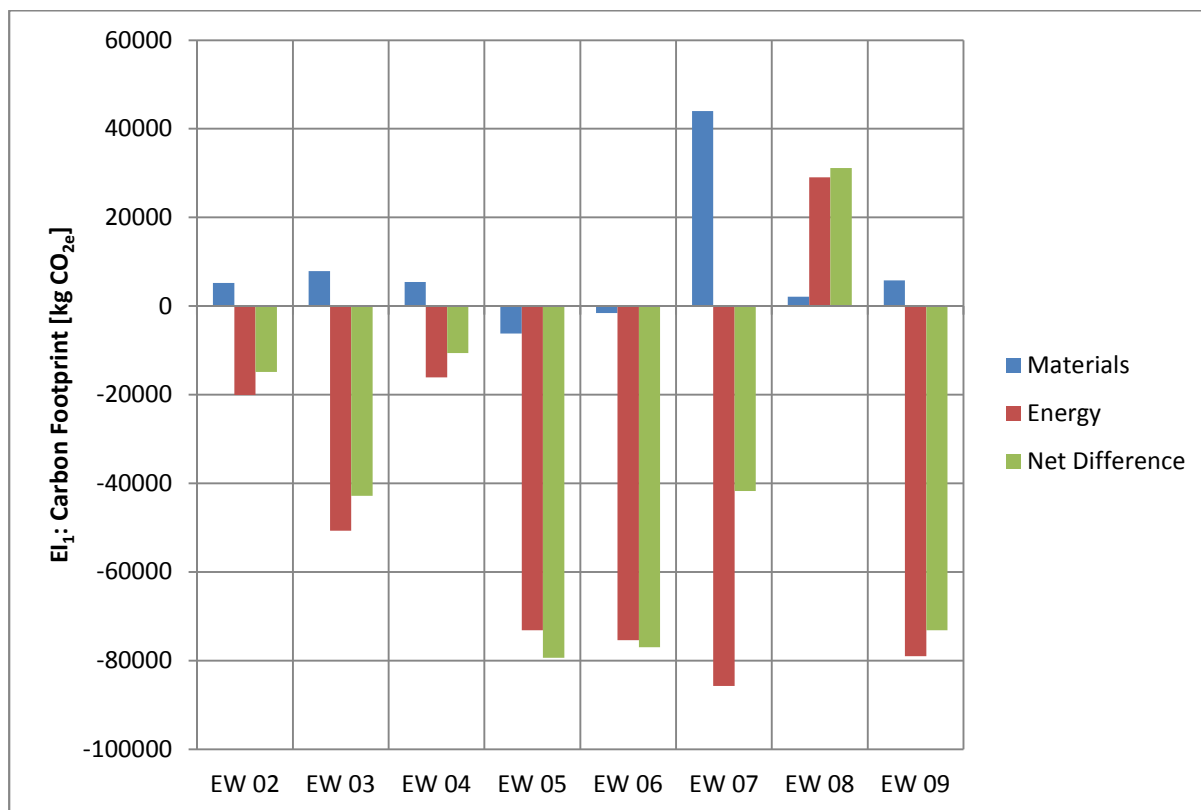


FIGURE D-1: EI1 RESULTS (CHANGE COMPARED TO REFERENCE DESIGN)



FIGURE D-2: EI2 RESULTS (CHANGE COMPARED TO REFERENCE DESIGN)

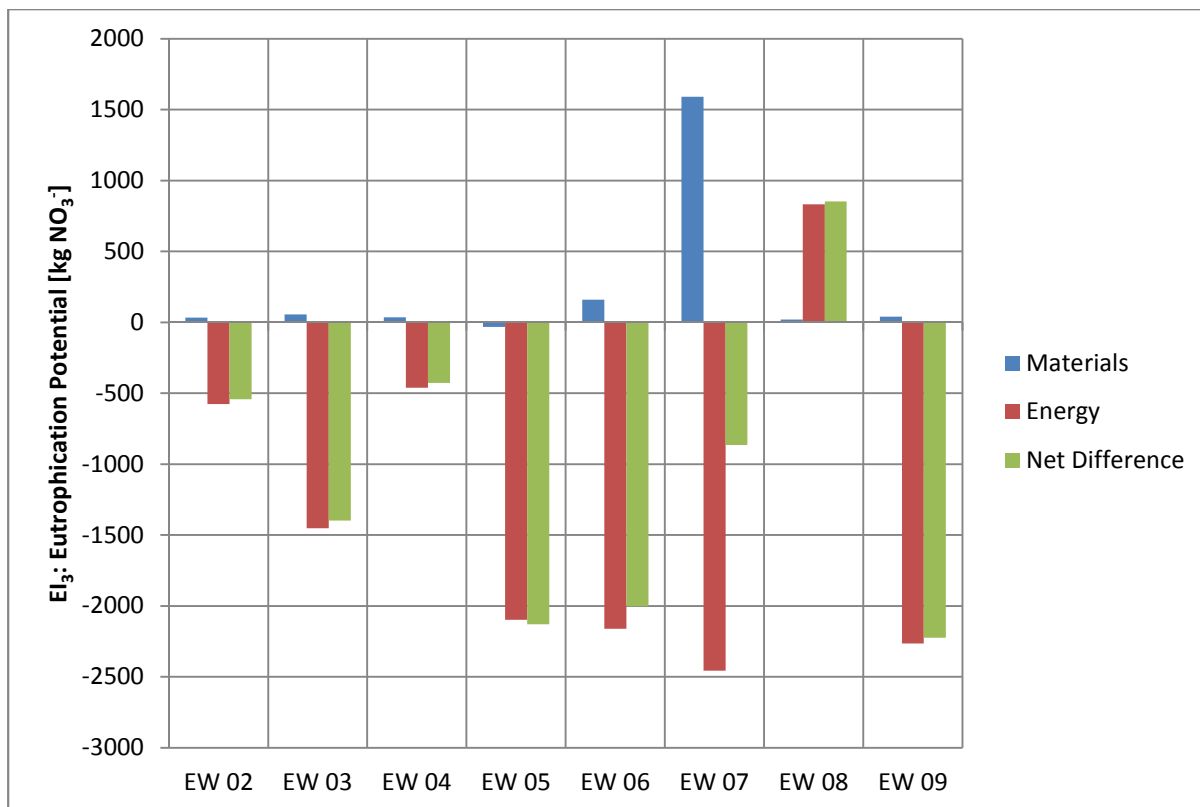


FIGURE D-3: EI3 RESULTS (CHANGE COMPARED TO REFERENCE DESIGN)

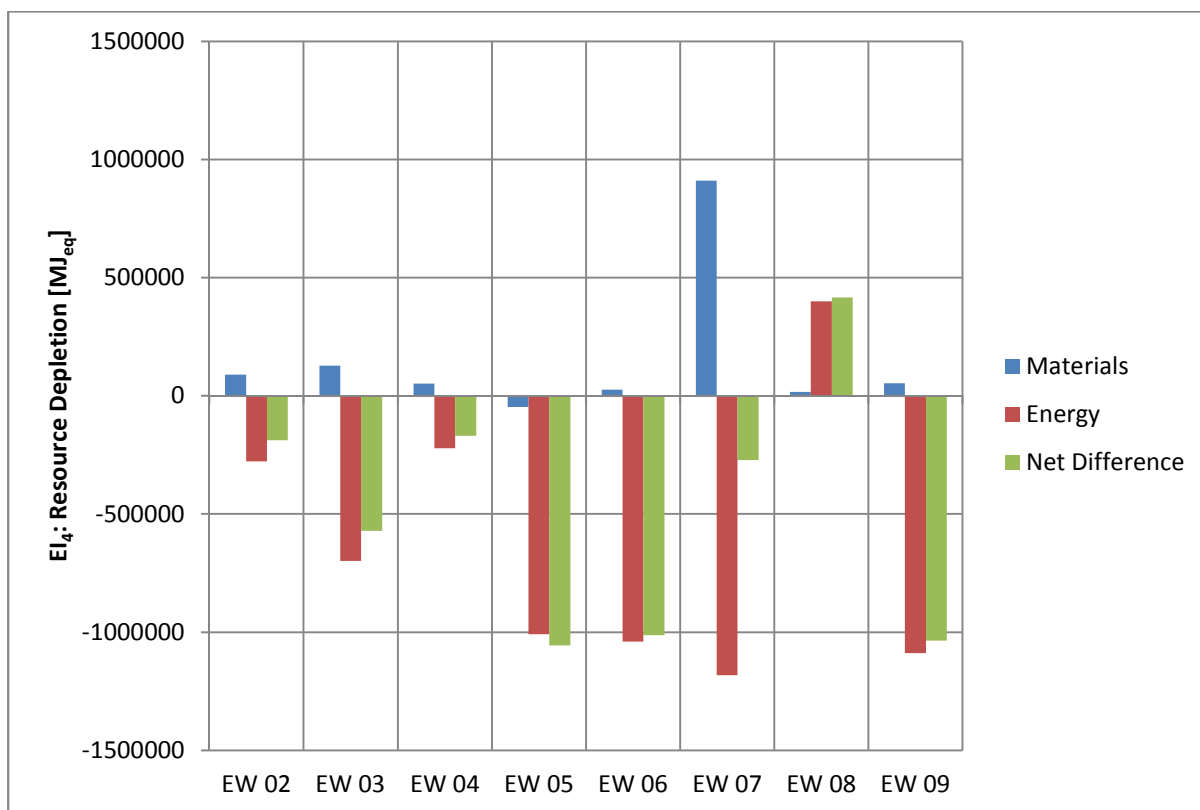


FIGURE D-4: EI4 RESULTS (CHANGE COMPARED TO REFERENCE DESIGN)

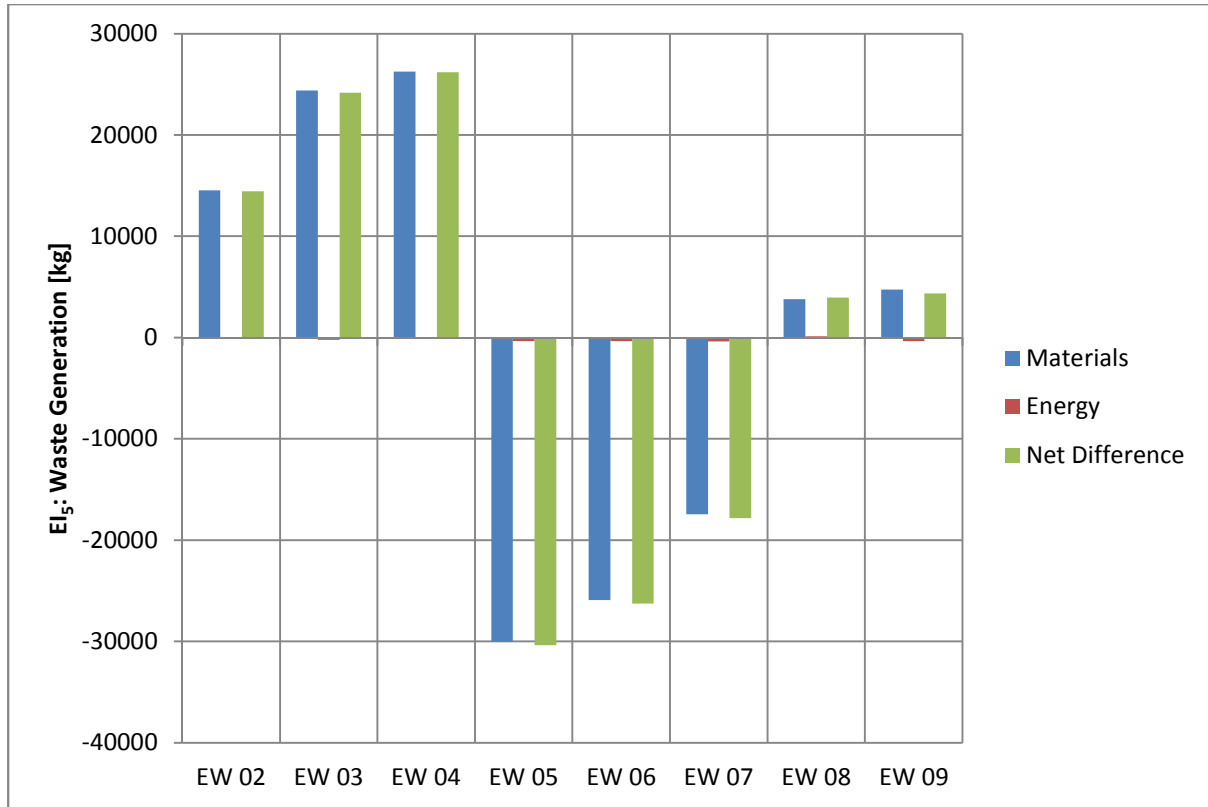


FIGURE D-5: EI5 RESULTS (CHANGE COMPARED TO REFERENCE DESIGN)

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12. ecoinvent database. Material category: Insulating materials. Material name: Glass fibre/wool – resin bonded, at 50C degrees.
13. ecoinvent database. Material category: Plaster. Material name: Gypsum Plasterboard.
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Appendix E: COMPLETE SENSITIVITY ANALYSES RESULTS

E1. ADDITIONAL TRANSPORT DISTANCES (TO CONSTRUCTION SITE)

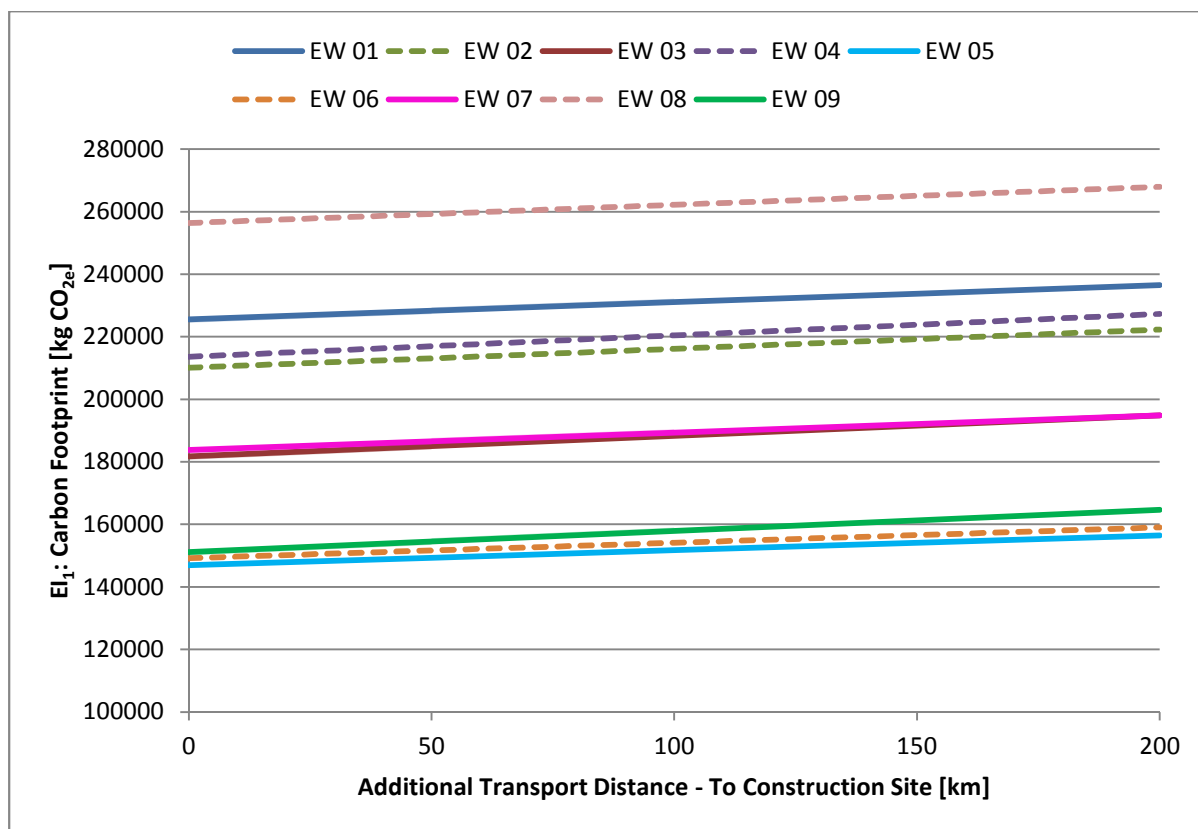


FIGURE E-1: ADDITIONAL TRANSPORT TO CONSTRUCTION SITE SENSITIVITY – E11

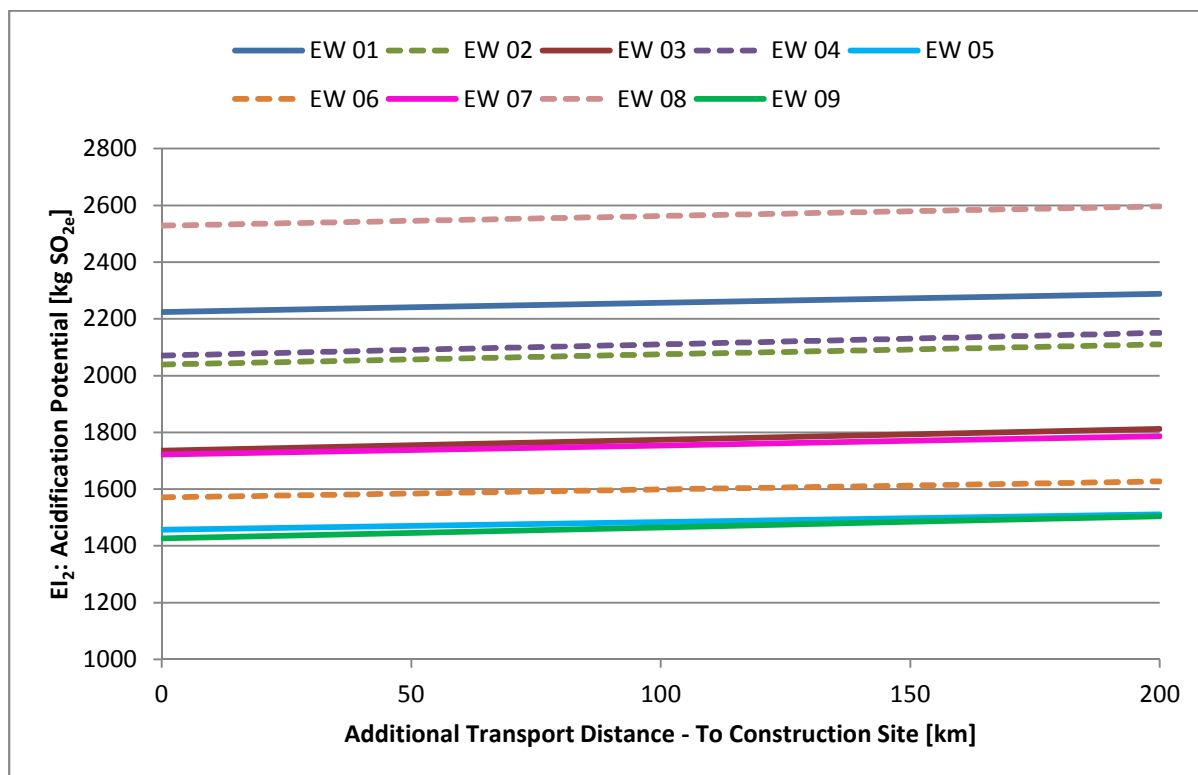


FIGURE E-2: ADDITIONAL TRANSPORT TO CONSTRUCTION SITE SENSITIVITY – E12

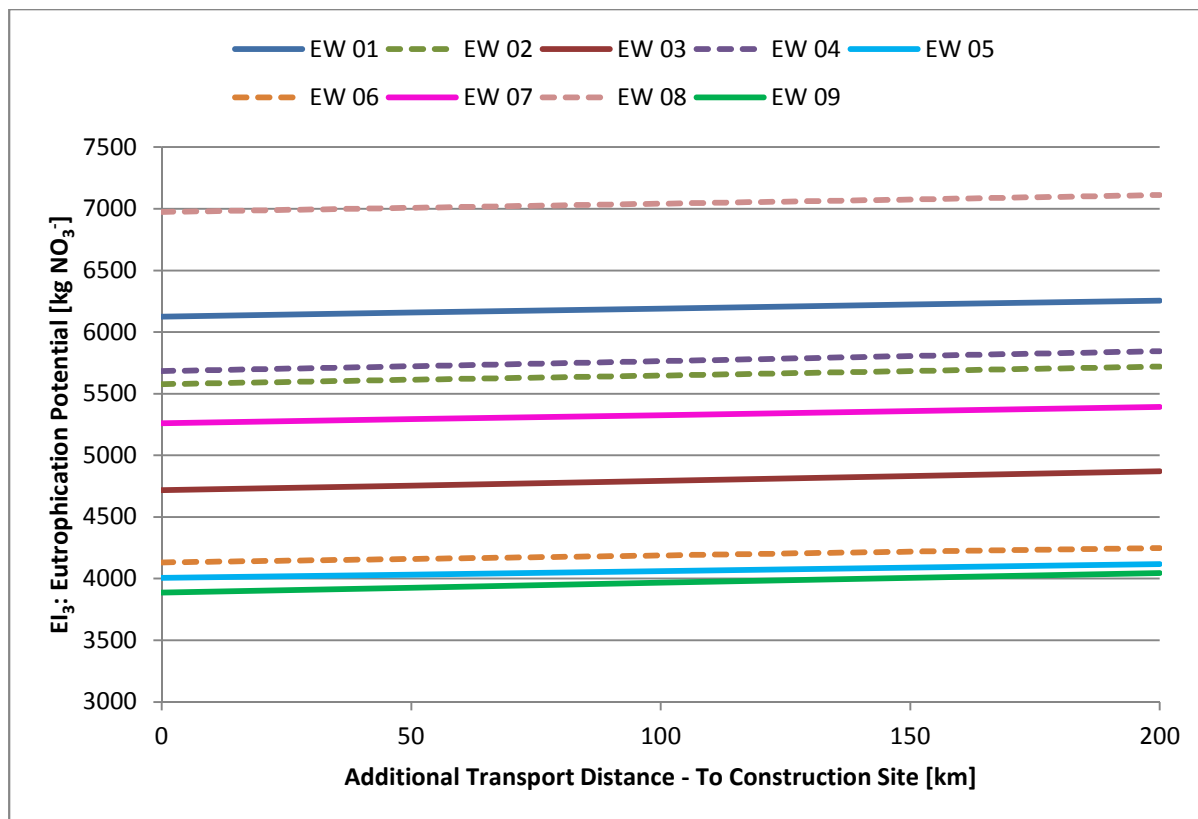


FIGURE E-3: ADDITIONAL TRANSPORT TO CONSTRUCTION SITE SENSITIVITY – EI3

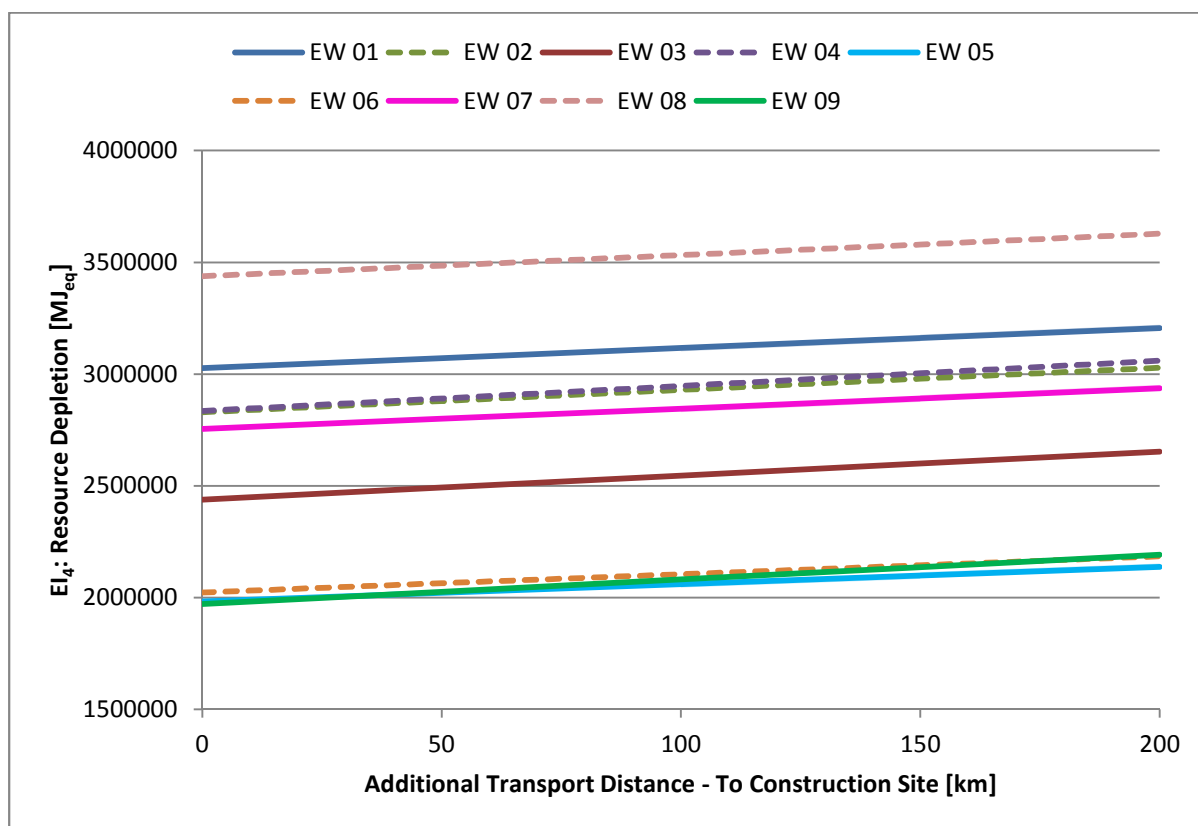


FIGURE E-4: ADDITIONAL TRANSPORT TO CONSTRUCTION SITE SENSITIVITY – EI4

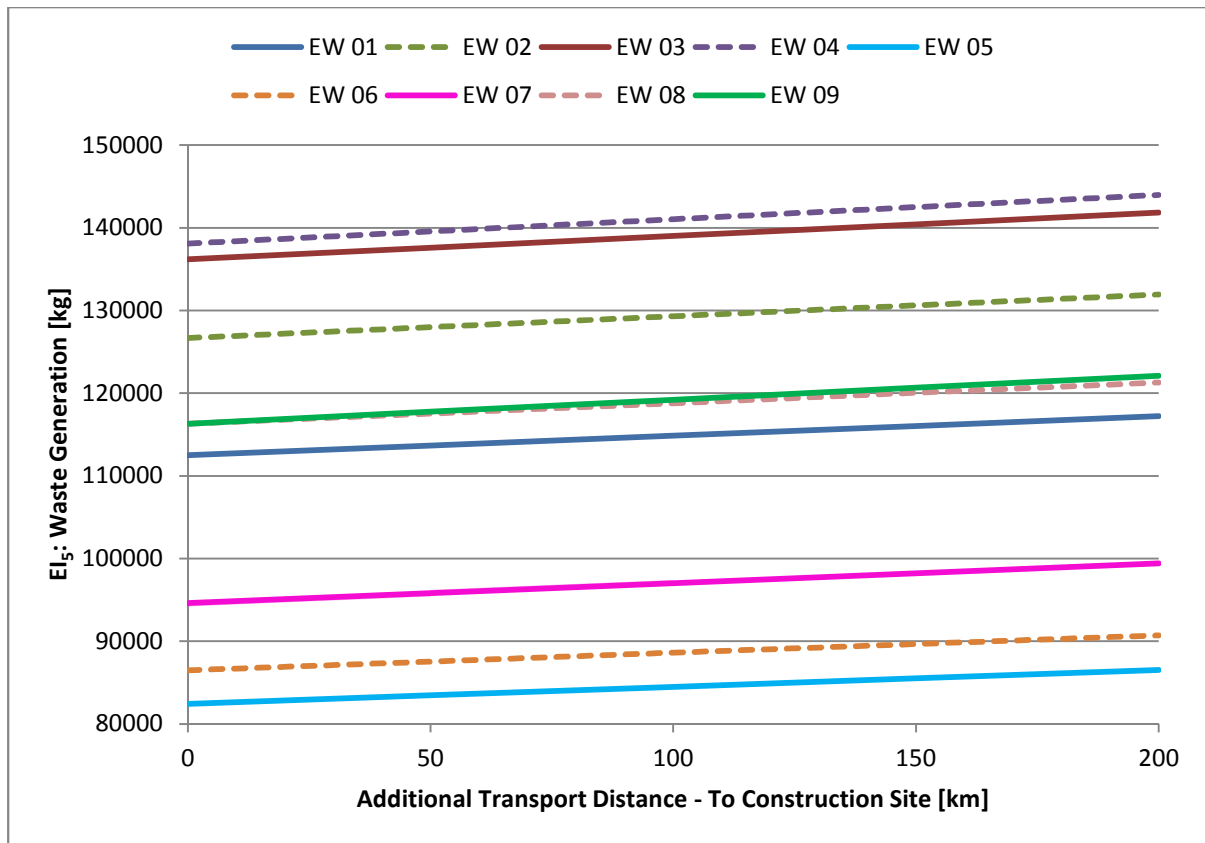


FIGURE E-5: ADDITIONAL TRANSPORT TO CONSTRUCTION SITE SENSITIVITY – EIS

E2. ADDITIONAL TRANSPORT DISTANCES (TO DISPOSAL)

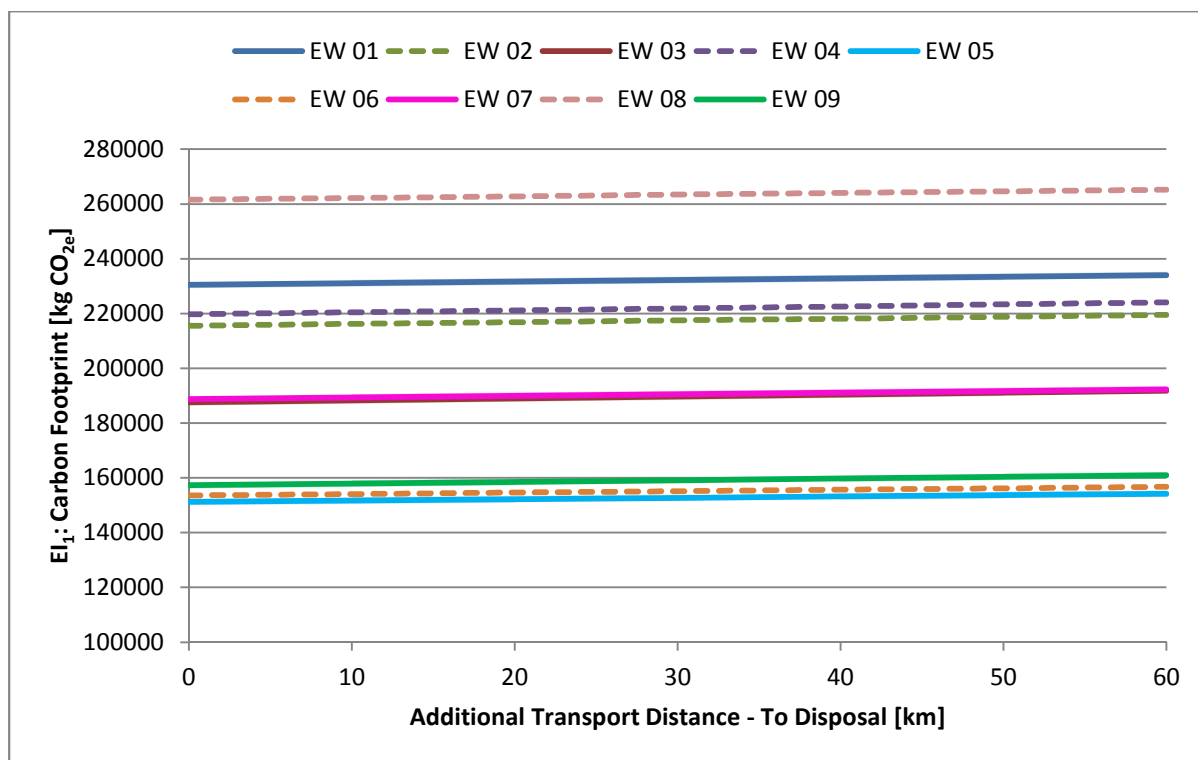


FIGURE E-6: ADDITIONAL TRANSPORT TO DISPOSAL SENSITIVITY - EI1

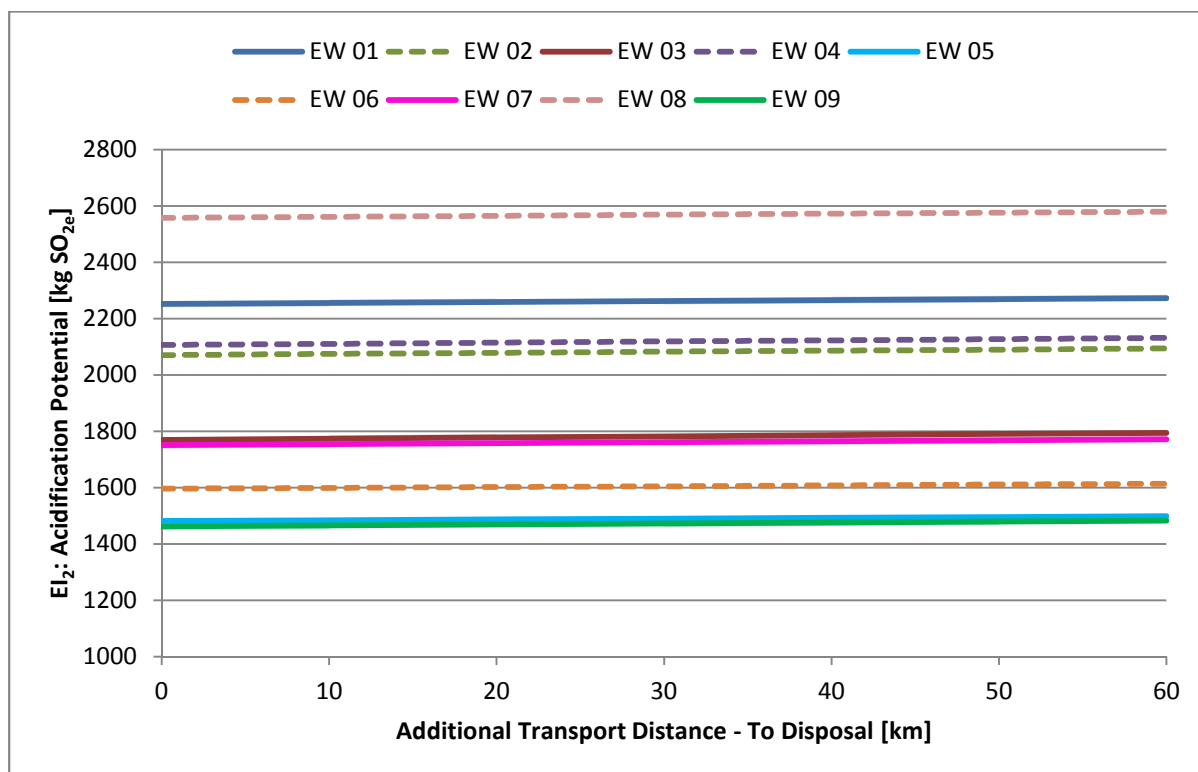


FIGURE E-7: ADDITIONAL TRANSPORT TO DISPOSAL SENSITIVITY - EI2

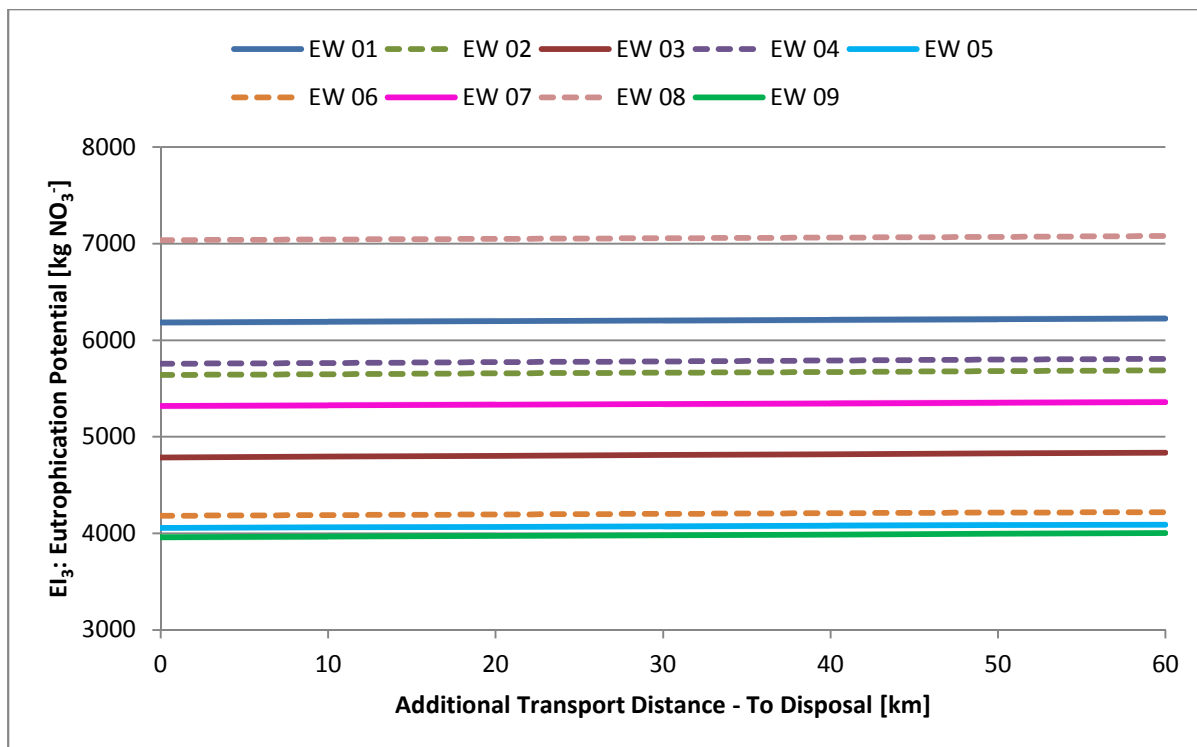


FIGURE E-8: ADDITIONAL TRANSPORT TO DISPOSAL SENSITIVITY - EI3

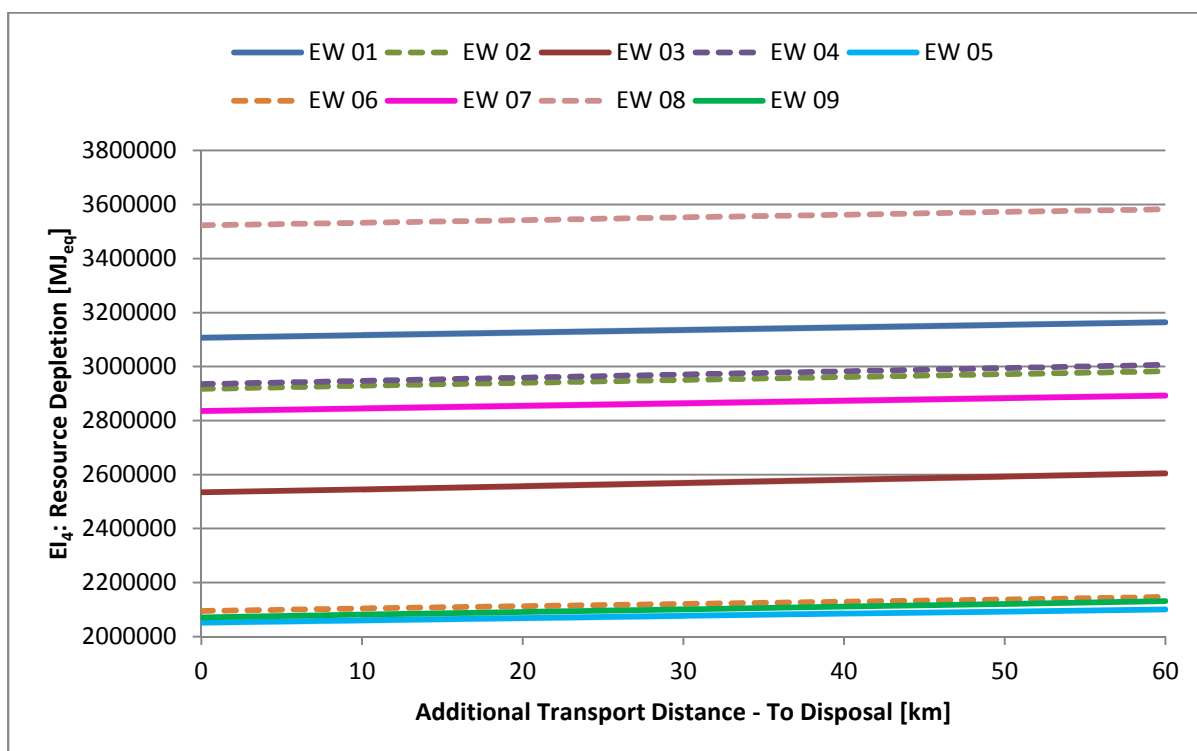


FIGURE E-9: ADDITIONAL TRANSPORT TO DISPOSAL SENSITIVITY - EI4

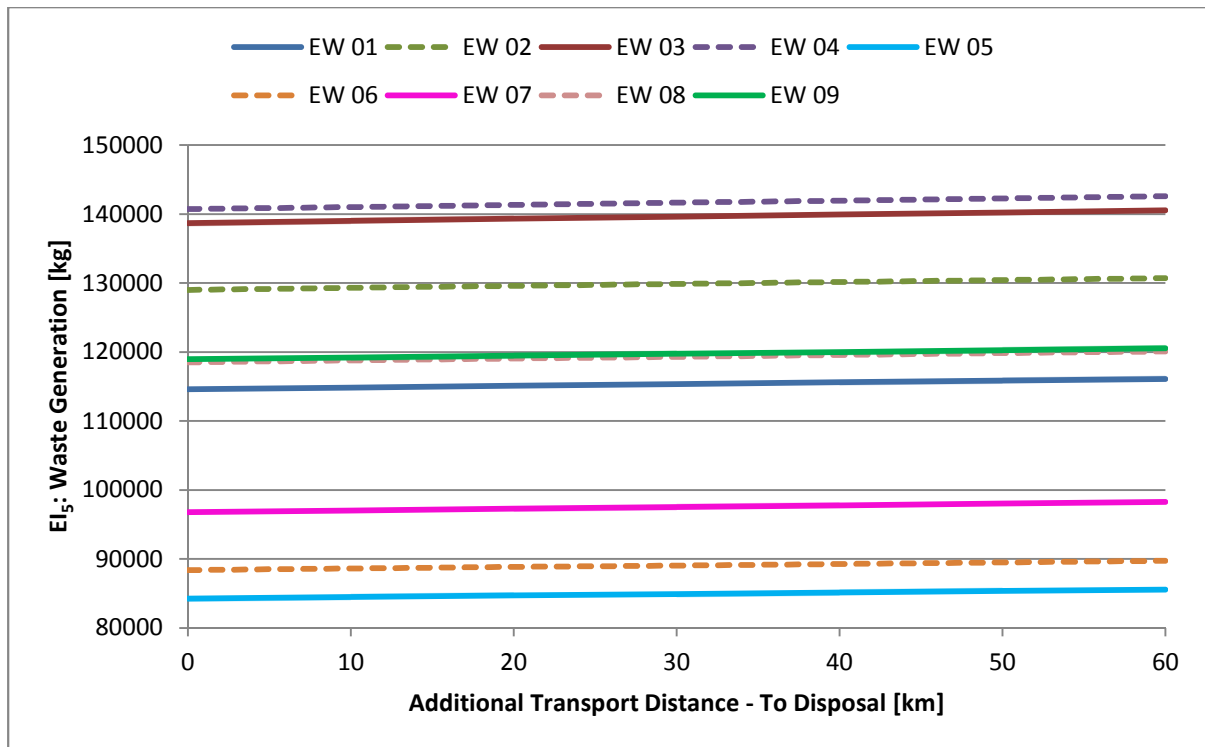


FIGURE E-10: ADDITIONAL TRANSPORT TO DISPOSAL SENSITIVITY - EI5

E3. DWL SENSITIVITY ANALYSIS

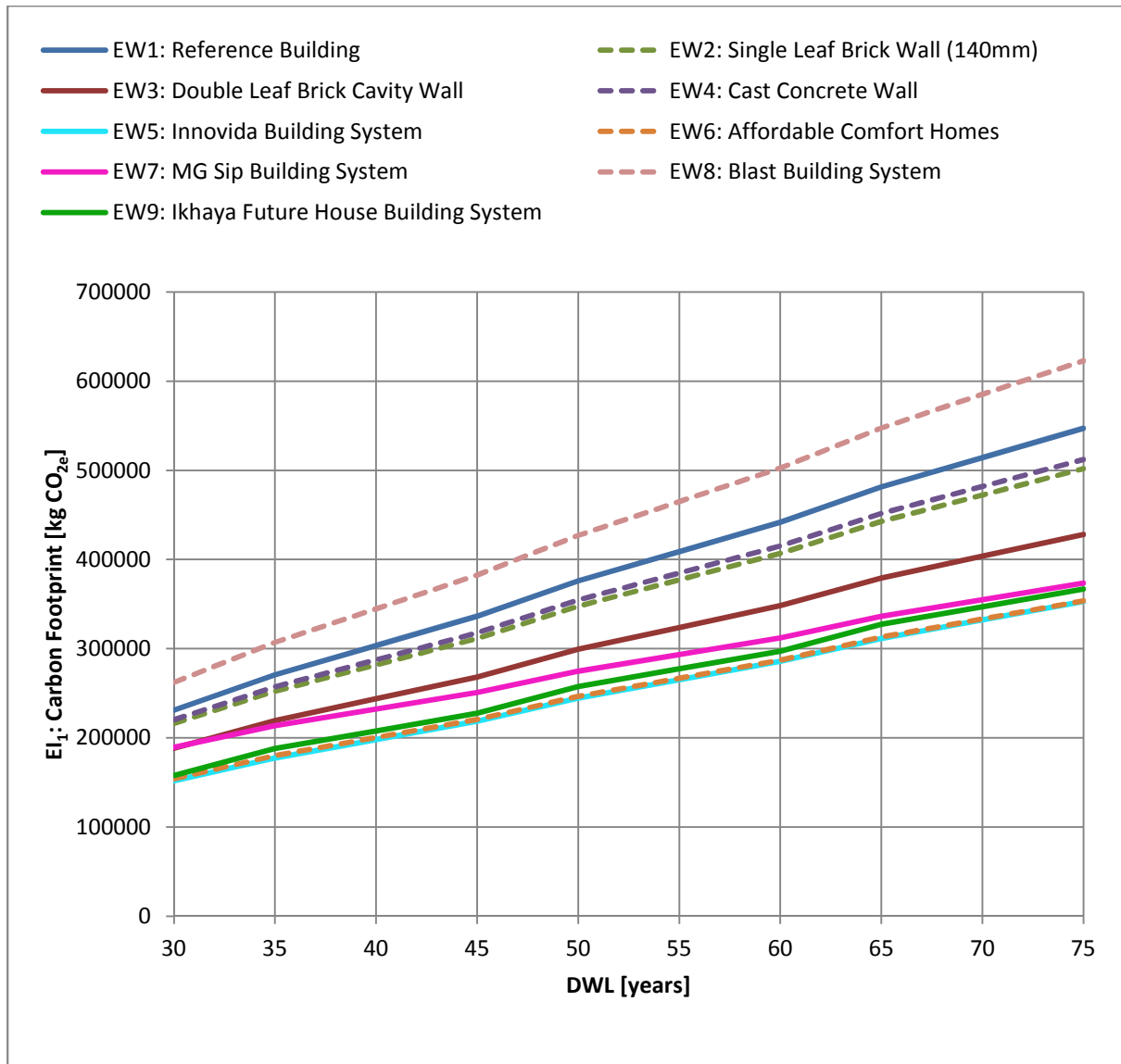


FIGURE E-11: DWL SENSITIVITY - EI1

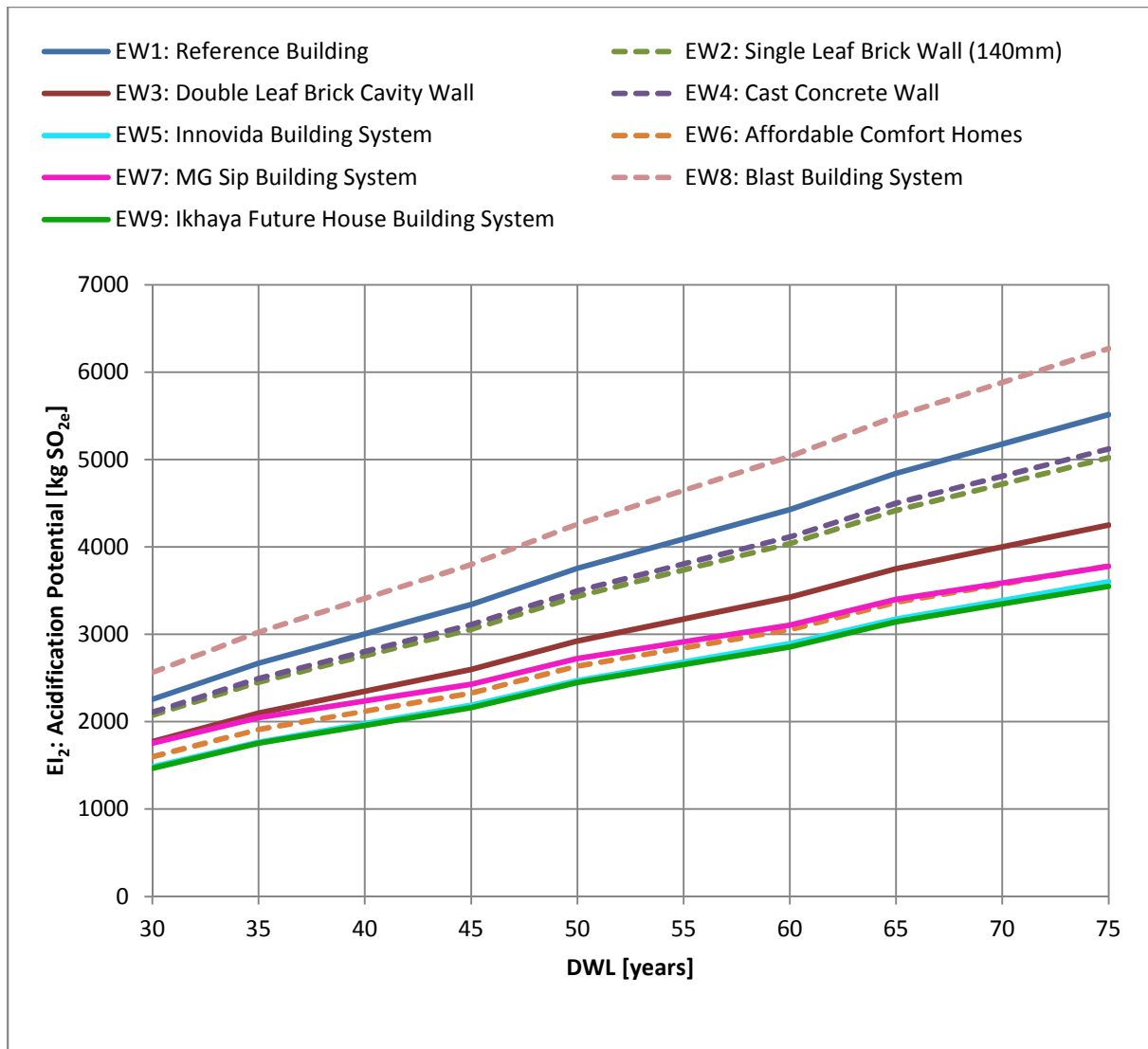


FIGURE E-12: DWL SENSITIVITY - E12

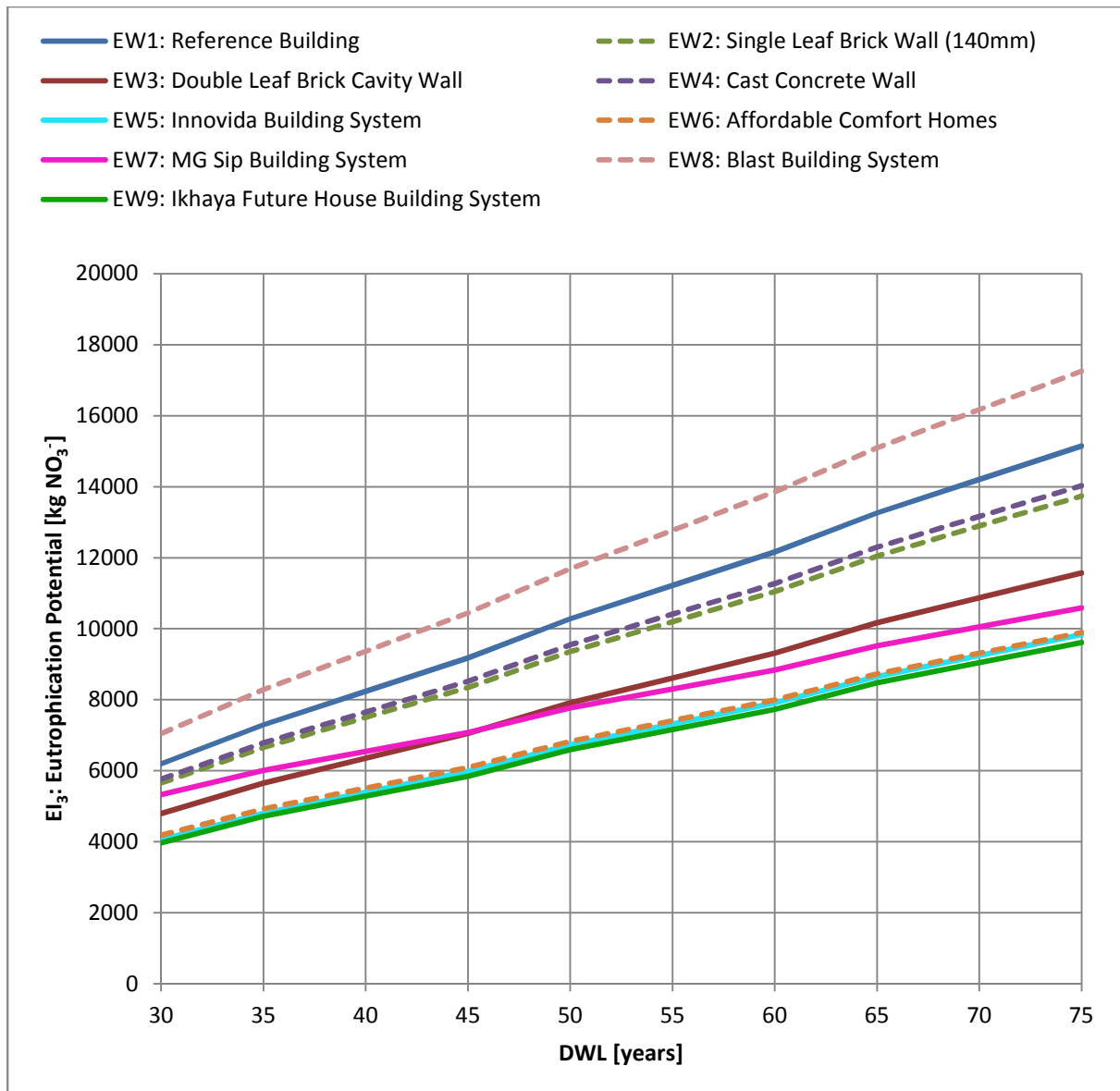


FIGURE E-13: DWL SENSITIVITY - EI3

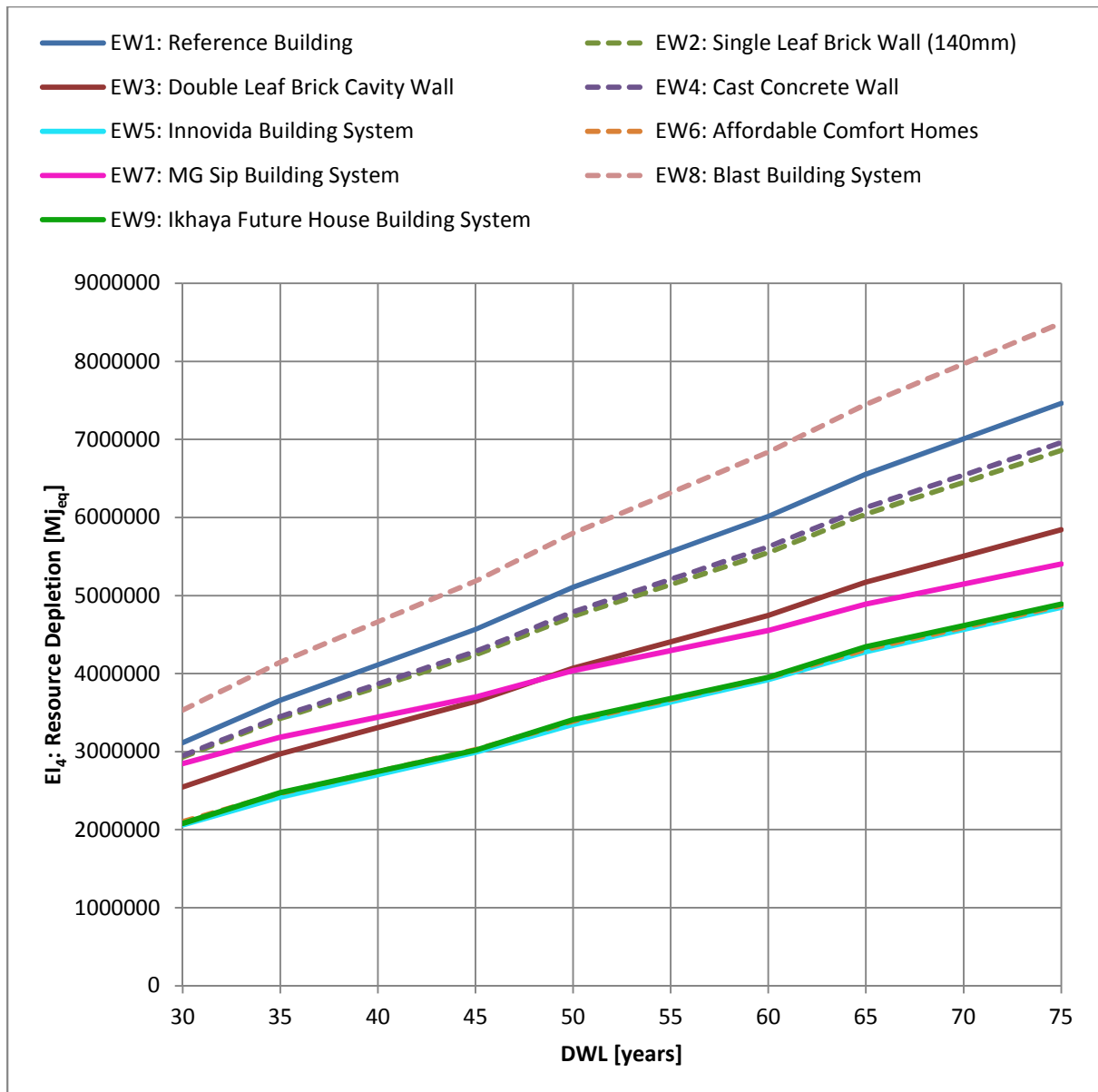


FIGURE E-14: DWL SENSITIVITY - EI4

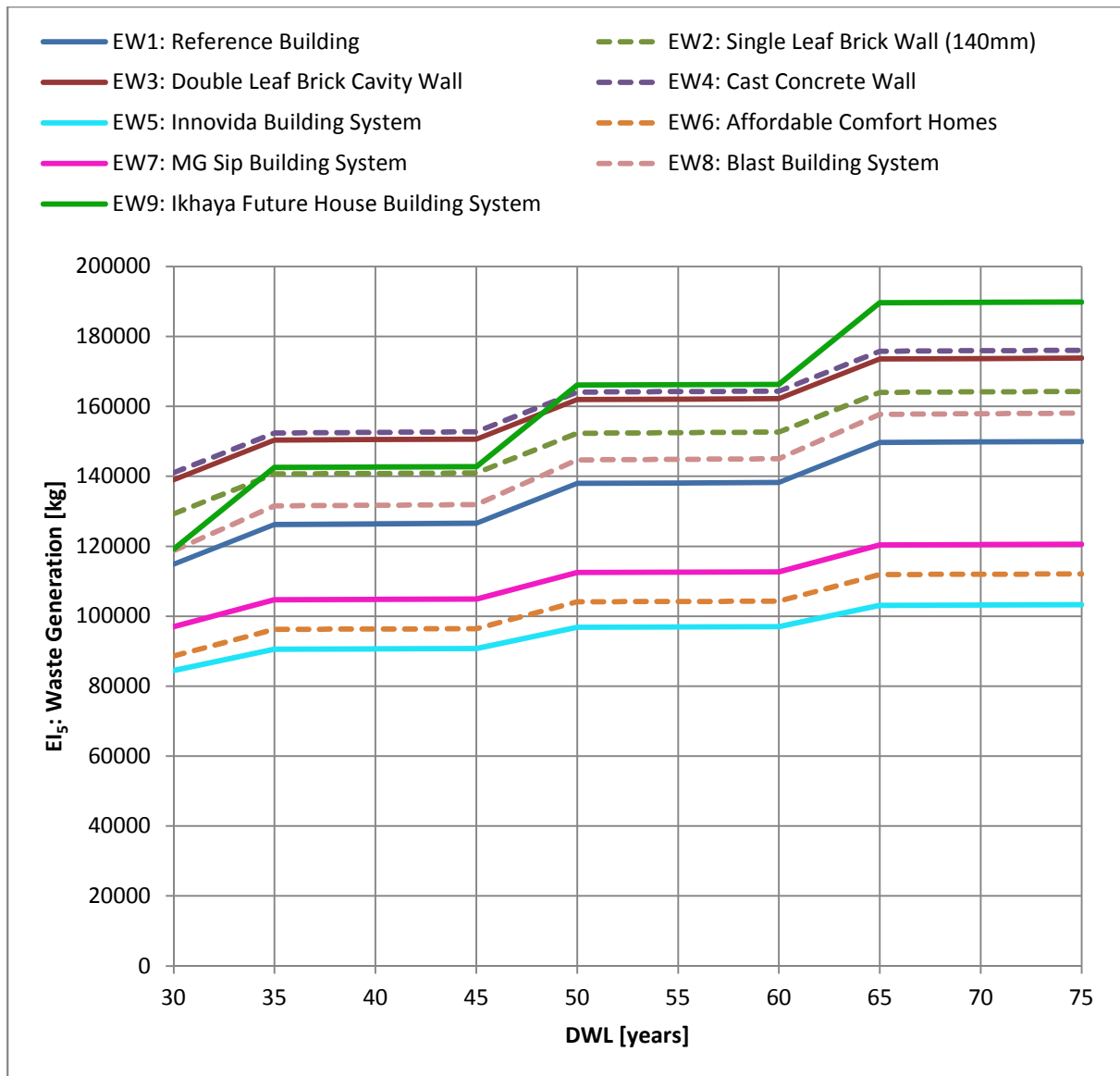


FIGURE E-15: DWL SENSITIVITY - EI5

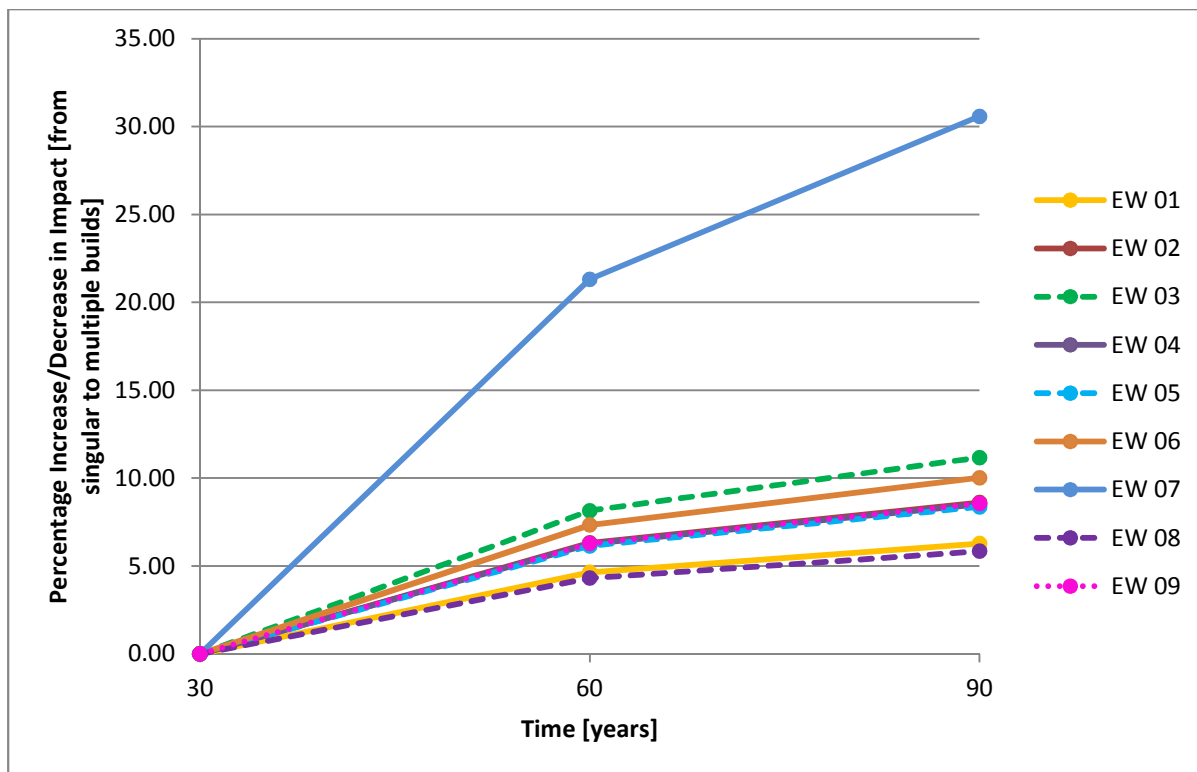


FIGURE E-16: DWL - SINGLE-BUILD VS MULTIPLE-BUILD STRUCTURES (E11)

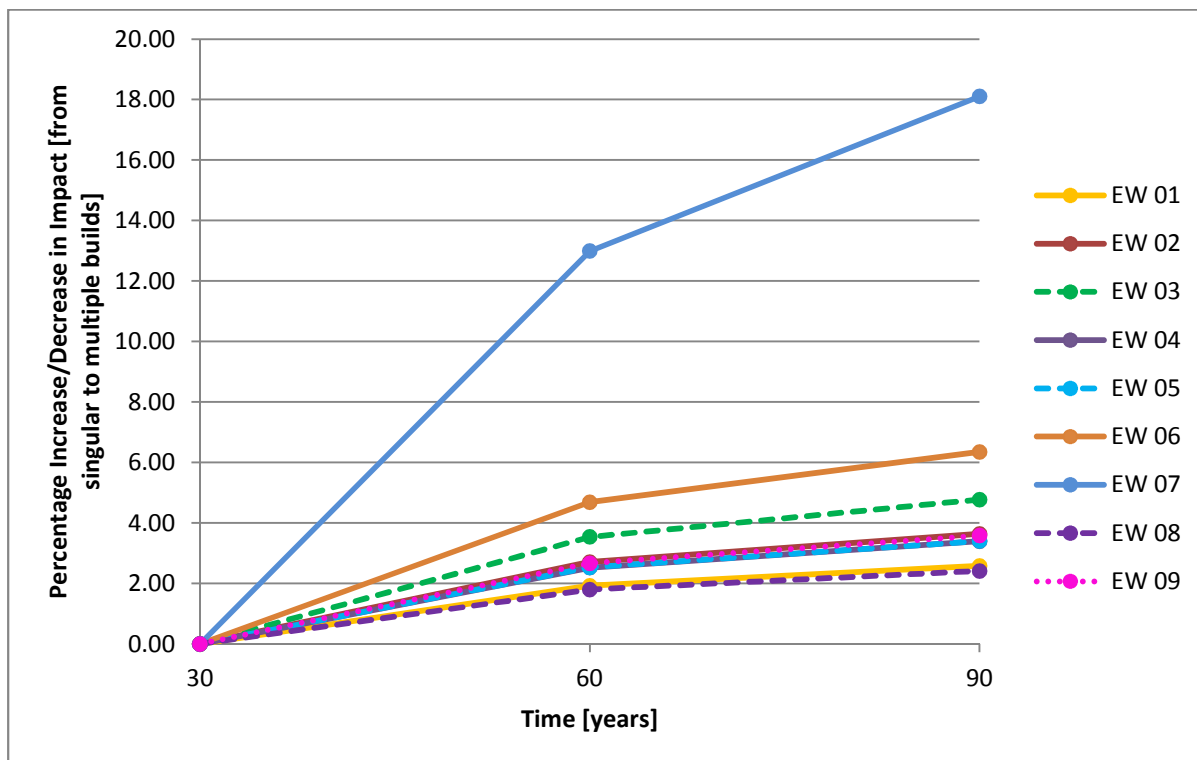


FIGURE E-17: DWL - SINGLE-BUILD VS MULTIPLE-BUILD STRUCTURES (E12)

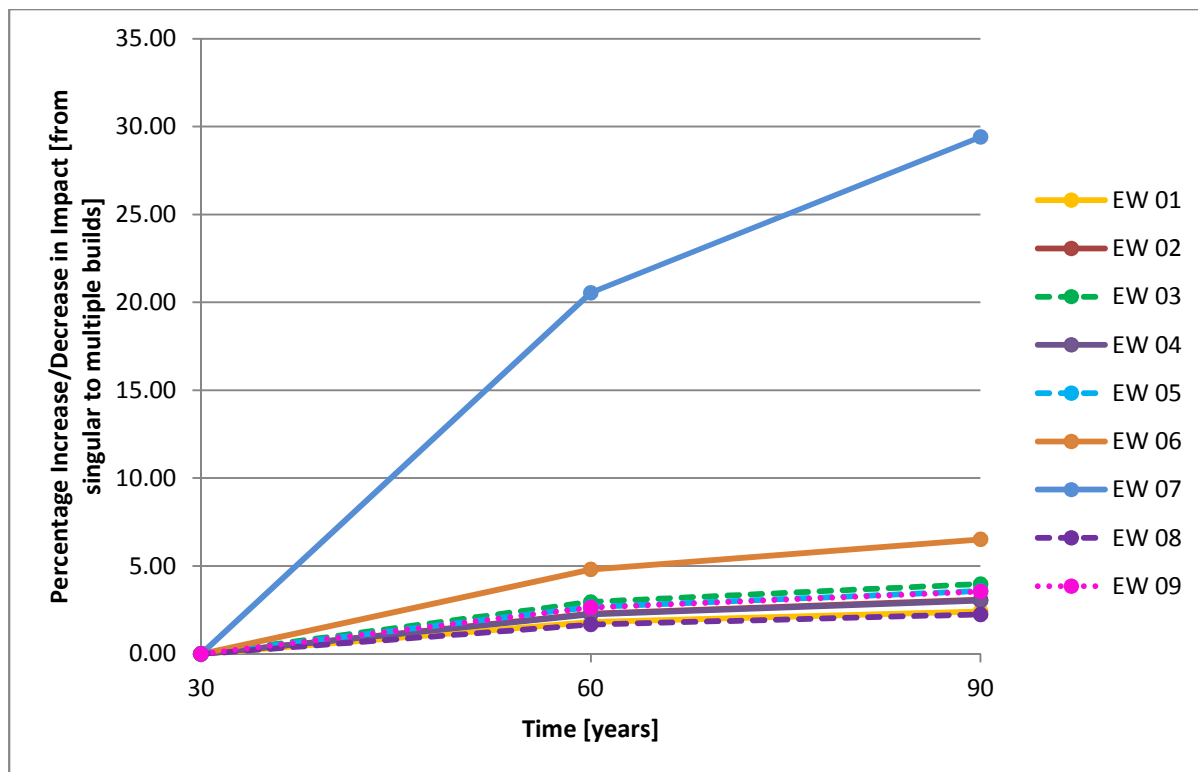


FIGURE E-18: DWL – SINGLE-BUILD VS MULTIPLE-BUILD STRUCTURES (E13)

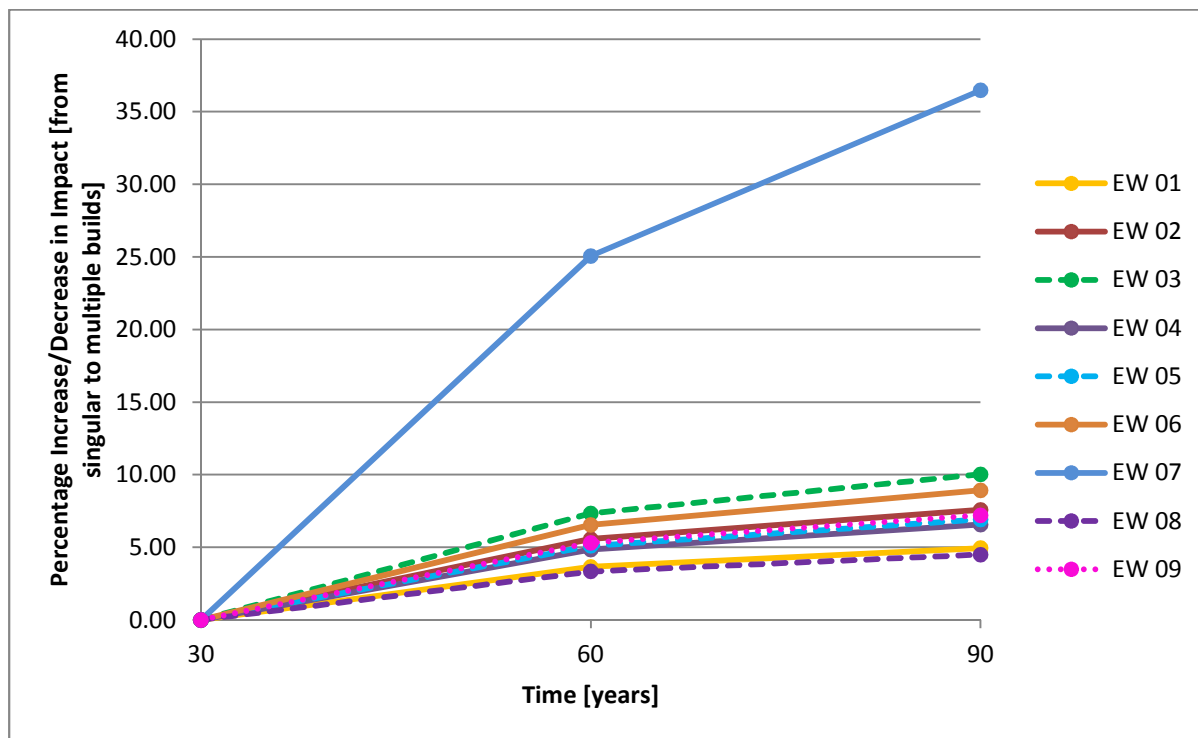


FIGURE E-19: DWL – SINGLE-BUILD VS MULTIPLE-BUILD STRUCTURES (E14)

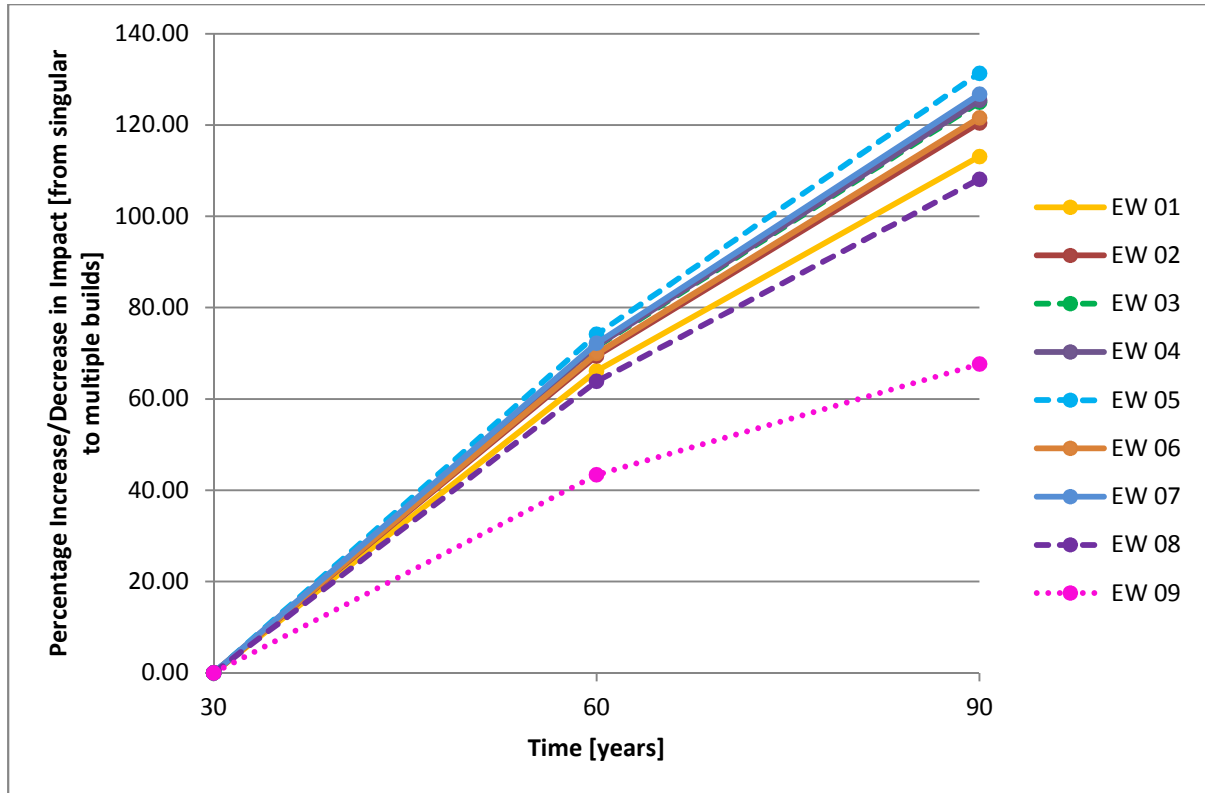


FIGURE E-20: DWL – SINGLE-BUILD VS MULTIPLE-BUILD STRUCTURES (E15)