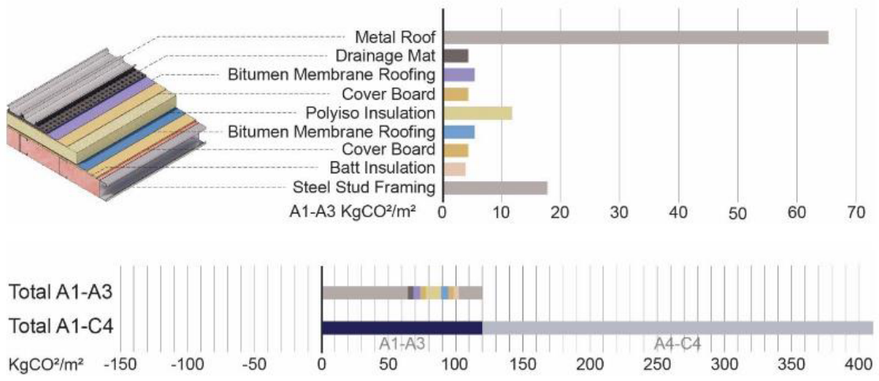
APPENDIX A **ROOF ASSEMBLY 05**

R05: Results Summary

Metrics	Results
Description	**Sloped Metal Roof Assembly**
Effective R-value	RSI-5.5 m^2K/W | R-31.4 $ft^2{\cdot}°F{\cdot}h/BTU$
Embodied Carbon per m^2 of Enclosure (A1-A3)	120.8 $kgCO_2/m^2$
Biogenic Carbon per m^2 of Enclosure	0 $kgCO_2/m^2$



R05: Assembly Effective R-value Calculation

Description	t_{SI}	t_{IP}	k	C (USI)	$RSI_{effective}$	$R_{effective}$	$R_{nominal}$
Units	mm	in	W/mK	W/m^2K	m^2K/W	$ft^2{\cdot}°F{\cdot}h/BTU$	$ft^2{\cdot}°F{\cdot}h/BTU$
Interior air film					0.11	0.61	
Steel stud roof framing with batt insulation	152.40	6.00	-	-	1.30	7.38	
Roof sheathing	12.70	0.50	0.13	10.08	0.10	0.56	
Underlayment	0.80	0.03	-	-	-	-	
Faced rigid polyisocyanurate insulation, fully adhered (polyurethane adhesive)	101.60	4.00	0.03	0.26	3.95	22.40	22.40
Asphalt protection board	6.35	0.25	0.13	20.16	0.05	0.28	
Underlayment	0.80	0.03	-	-	-	-	
Drainage mat	4.00	0.16	-	-	-	-	
Metal roofing	38.10	1.50	62.00	-	-	-	
Exterior air film					0.03	0.17	
TOTALS	**316.80**	**12.50**			**5.50**	**31.40**	**22.40**

R05: Embodied Carbon Emissions (A1 to A3 Life Stages) for 9m² Assembly Area

Category	Material	Description (from EPD)	Thickness	Material Volume	Carbon Emissions (A1-A3)	% of total
Units			mm	m^3	kgCO2e	%
Back-up structure	Steel stud framing with batt insulation	Steel stud framing for drywall/gypsum plasterboard per sq. meter of wall area (incl. air gaps per m3), C-profile: 152.4 x 76.2, gauge 20, 3 m height x 406.4 mm (400 mm) spacing (Generic)	-	*	160	14.5%
Exterior Insulation	Batt insulation	Mineral fiber batt insulation	152.4 (6")	1.029	31	2.80%
Sheathing	Roof structure sheathing	Roof cover board, fiberglass facing, 9.92 kg/m2, EVERBOARD™ - ½ fiberglass faced (Continuous Materials, plant Philadelphia)	12.7 (0.5")	*	37	3.4%
Membrane	Underlayment, butyl-based high temperature resistant sheet membrane, min. 30 mils	SBS polymer-modified bitumen membrane roofing, self-adhered, 6.69 kg/m2 (Certain Teed, Henry, IKO, Malarkey Roofing Products, Siplast, Soprema)	0.8 (0.03")	*	60	5.6%
Exterior Insulation	Fully adhered polyisocyanurate insulation board with coated composite facer, minimum 2-inches	Polyisocyanurate (PIR) roof insulation boards, coated glass faced (CGF), 0.941kg/m2 (2.07 lb/m2), 25 mm (0.984 in) (Atlas Roofing Corporation, Carlisle Construction Materials, Firestone Building Products, GAF, IKO, Johns Manville, Rmax - A Sika Brand, Soprema, Inc. (USA))	101.6 (4")	0.9144	110	9.9%
Insulation Protection	Cover Board	Roof cover board, fiberglass facing, 9.92 kg/m2, EVERBOARD™ - ½ fiberglass faced (Continuous Materials, plant Philadelphia)	6.35 (0.25")	*	37	3%
Membrane	Underlayment, high temperature resistant sheet membrane, 30 mil	SBS polymer-modified bitumen membrane roofing, self-adhered, 6.69 kg/m2 (Certain Teed, Henry, IKO, Malarkey Roofing Products, Siplast, Soprema)	0.8 (0.03")	0.0072	60	5.6%
Drainage	Drainage mat	Drainage mat and moisture barrier, 2.15 kg/m2, DrainScreen (Sto)	4 (0.16")	*	2.5	0.2%
Exterior finish	Metal Roof	Aluminum roofing, hot rolled plate, 2660-2840 kg/m3 (Aluminum Association)	38.1 (1.5")	0.3429	590	54.5%
				TOTAL	**1088**	

**Software auto-calculates the impact based on the area provided.*

R05: Environmental Emissions (A1 to C4 Life Stages) for 9m² Assembly Area

Lifecycle Stage		**A1 to C4**	A1-A3	A4-A5	B1-B5	C1-C4	A1-A3 Contribution to total
Category	Units	**Total**	Construction Materials	Transport to Site & Construction	Material Replacement & Refurbishment	Deconstruction	%
Global Warming	kg CO2e	**3711.58**	1090.07	25.84	739.88	1855.79	29.37%
Acidification	kg SO	**1.03E-04**	1.78E-05	6.81E-06	2.71E-05	5.17E-05	17.21%