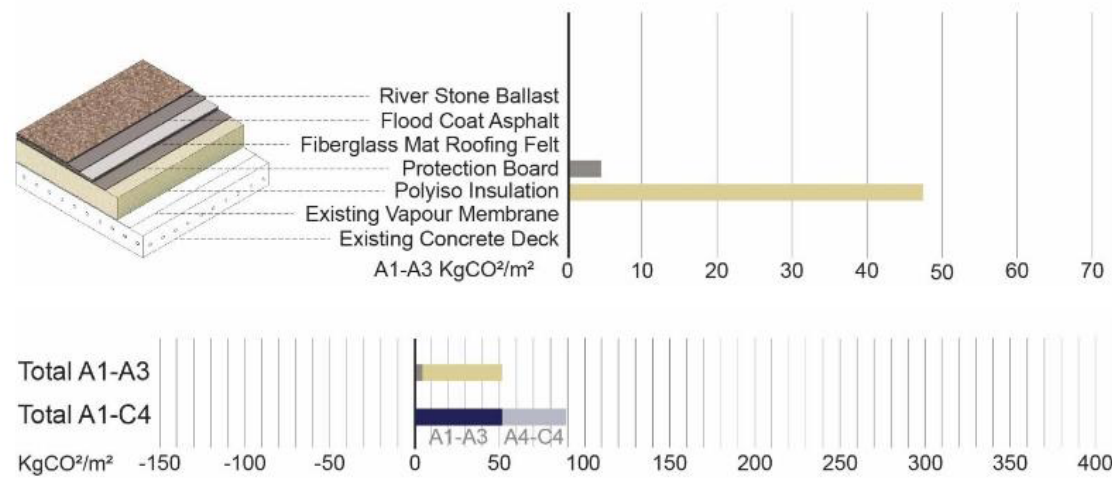


APPENDIX A ROOF ASSEMBLY 04

R04: Results Summary

Metrics	Results
Description	Existing BUR Roof Replacement over Polyisocyanurate Insulation
Effective R-value	RSI-5.5 m ² /K/W R-31.2 ft ² ·°F·h/BTU
Embodied Carbon per m ² of Enclosure (A1-A3)	52.31 kgCO ₂ /m ²
Biogenic Carbon per m ² of Enclosure	0 kgCO ₂ /m ²



R04: 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 ² K	m ² K/W	ft ² ·°F·h/BTU	ft ² ·°F·h/BTU
Interior air film					0.11	0.61	
Existing concrete roof structure	254.00	10.00	1.60	6.30	0.16	0.90	
Existing self-adhered sheet-applied air barrier and vapour-impermeable membrane	0.80	0.03	-	-	-	-	
Rigid polyisocyanurate insulation, fully adhered (mopped asphalt)	127.00	5.00	0.03	0.21	4.93	28.00	28.00
Asphalt protection board, fully adhered (mopped asphalt)	4.80	0.19	-	-	0.14	0.79	
4-ply fibreglass mat roofing felt, set in mopped asphalt	20.00	0.79	-	-	0.12	0.67	
Asphalt flood coat, with embedded river stone ballast	6.00	0.24	0.43	71.67	0.01	0.08	
Exterior air film					0.03	0.17	
TOTALS	412.60	16.20			5.50	31.20	28.00

R04: 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	kgCO ₂ e	%
Existing structure	Existing Concrete deck	Not Included in calculations	-	-	-	-
Existing membrane	Existing vapour impermeable membrane		-	-	-	-
Insulation	Polyisocyanurate insulation set in coat of asphalt (mopped)	Generic Polyisocyanurate (PIR) insulation boards (Generic)	127 (5")	1.143	430	91.1%
Insulation Protection	Protection Board set in coat of asphalt	Roof cover board, fiberglass facing, 6.1 kg/m ² , EVERBOARD™ - ¼ fiberglass faced (Continuous Materials, plant Philadelphia)	4.8 (0.19")	0.0432	36	7.8%
Insulation Facing	4 ply fiberglass mat roofing felt in mopped asphalt	Fiberglass mat used as insulation facing, 0.062 kg/m ² (Owens Corning)	20 (0.8")	0.18	1.8	0.4%
	Flood coat asphalt (x1) 2mm adhesive layer of mopped asphalt in between each layer of felt (x4) 0.5mm	Asphalt, hot-mix, Nominal Maximum Aggregate Size: 12.7 mm (0.5 inches), 10095203 Grd 3 Pre-coat (RK Hall LLC, Plant 07 Paris plant)	3.2 (0.13")	66 kg	2.7	0.6%
Exterior Finish	embedded river stone ballast	Rock to be used for erosion control, Granite Canyon (WY), D4992-14e1, BALLAST (Martin Marietta)	6 (0.24")	0.054	0.33	0.1%
TOTAL					471	

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

R04: 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 CO ₂ e	809.4136	466.54	2.3668	169.07	171.4368	57.64%
Acidification	kg SO	5.89E-05	3.52E-05	6.26E-07	1.12E-05	1.18E-05	59.81%
Eutrophication	kg Ne	2.736358	2.1637	0.013329	0.273	0.286329	79.07%
Ozone Depletion	kg CFC11e	1.63835	1.25666	0.001845	0.189	0.190845	76.70%
Formation of Tropospheric Ozone	kg O ₃ e	34.0532	24.985	0.3841	4.15	4.5341	73.37%
Fossil Fuel Primary Energy	MJ	8410.02	7849.56	67.12	213.11	280.23	93.34%
Biogenic Carbon Storage	kg CO ₂ e	0					