

Statement of Verification

BREG EN EPD No.: 000479

Issue 01

This is to verify that the
Environmental Product Declaration
provided by:
Creative Composites Group

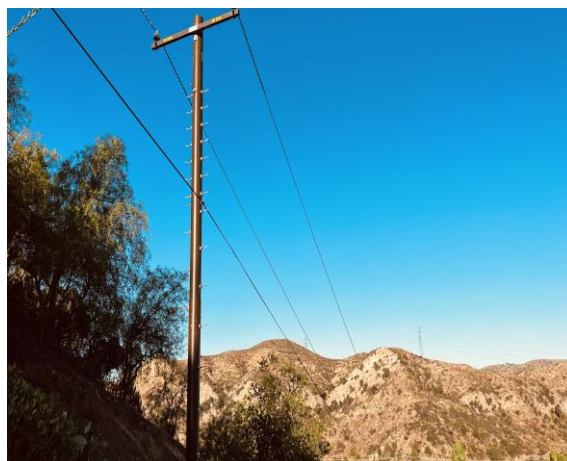


is in accordance with the requirements of:
EN 15804:2012+A1:2013
and
BRE Global Scheme Document SD207

This declaration is for:
1 metric ton of TU450 – vinyl ester 12" x 1/2" (305 mm x 12.7 mm) diameter round fibreglass reinforced polymer (FRP) pultruded utility pole.

Company Address

Creative Composites Group
Creative Pultrusions, Inc.
214 Industrial Lane
Alum Bank, PA 15521



Emma Baker
Operator

28 February 2023
Date of this Issue

28 February 2023
Date of First Issue

27 February 2028
Expiry Date



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Information modules covered

Product			Construction		Use stage							End-of-life				Benefits and loads beyond the system boundary
					Related to the building fabric					Related to the building						
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw materials supply	Transport	Manufacturing	Transport to site	Construction – Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal	Reuse, Recovery and/or Recycling potential
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Note: Ticks indicate the Information Modules declared.

Manufacturing site(s)

Creative Pultrusions Inc.
 214 Industrial Lane
 Alum Bank,
 PA 15521
 United States

Construction Product

Product Description

The product is a TU450 - vinyl ester 12" x 1/2" (305 mm x 12.7 mm) diameter round fiberglass reinforced polymer (FRP) pultruded utility pole. Similar poles are made in different diameters with both round and octagonal cross-sections. The round poles are made for longer and higher-class strength applications whereas the octagonal poles are made for shorter lower-class applications. This specific 12"x 1/2" diameter round pole was chosen due to its high-volume demand. The poles are used to support conductors for the distribution and transmission of electricity. In some instances, the poles are used to support telecommunication lines and 5G networks.

Technical Information

The below values have been taken from the StormStrong Composite Utility Poles technical data sheet for Round Pultruded Pole TU450 - vinyl ester 12" x 1/2" (305 mm x 12.7 mm).

Property	Value, Unit
Round Pole Mechanical Properties	
Flexural Strength per ASTM D1036 psi (Mpa) ³	58,825 (406)
Compression Strength per ASTM D1036 psi (Mpa) ³	58,825 (406)
Axial Compression Strength psi (Mpa) ³	58,825 (406)
Ultimate Axial Compression Capacity (Short Column) lbf (kg) ³	1,064,732 (482,954)
Modulus of Elasticity per ASTM D1036 psi (Gpa)	5.84E6 (40.3)
Bending Stiffness (EI) per ASTM D1036 lbs•in ² (kg•mm ²)	1.75E9 (512E9)

Property	Value, Unit
Ultimate Moment Capacity per ASTM D1036 lb-ft (kN•m) ³	244,124 (331)
Max. Bolt Torque lb•ft (N•m) ¹	50 (67.8)
Ultimate Pole Torque Strength lb•ft (N•m)	82,662 (112,075)
Ultimate Pin Bearing Strength Lengthwise psi (Mpa) ^{2,3}	24,585 (169.5)
Ultimate Pin Bearing Strength Crosswise psi (Mpa) ^{2,3}	14,063 (97.0)
Ultimate Washer Pull Through Strength kips (kg) ^{3,6}	18.9 (8,593)
Ultimate Shear Capacity, Calculated (lbs) (kN) ³	86,428 (384)
In-Plane Shear Strength per ASTM D5379 psi (Mpa) ³	9,550 (65.8)
<u>Physical Properties</u>	
Moment of Inertia in ⁴ (mm ⁴)	299 (1.24E8)
Section Modulus in ³ (mm ³)	49.8 (8.16E5)
Radius of Gyration in (mm)	4.07 (103.4)
Weight lb/ft (N/m)	16.9 (246.6)
Wall Thickness in (mm)	0.5 (12.7)
Coefficient of Thermal Expansion (CTE) Lengthwise in/in/°F	5.00E-06
Water Absorption ASTM D570 (max)	0.60% (24hrs)
Fiber Volume Fraction %	≥50%
Cross Sectional Area in ² (mm ²)	18.1 (11,700)
Surface Area ft ² /ft (m ² /m)	3.1 (0.96)
<u>Fire Properties</u>	
Flame Rating (UL 94)	V0 Self Extinguishing
Flame Spread ASTM E-84	Class A 25 or less
<u>Electrical Properties</u>	
ASTM F711 (100 kVAC per foot - 5 minutes dry) *	Passed
IEEE978 (75 kVAC per foot - 1 minute wet)	Passed



Main Product Contents

Material/Chemical Input	%
Rovings	40-50
Mats	30-40
Veils	0-2
Resin	15-25

Manufacturing Process

The product is manufactured through a process called pultrusion. The pultrusion manufacturing process consists of the following four steps:

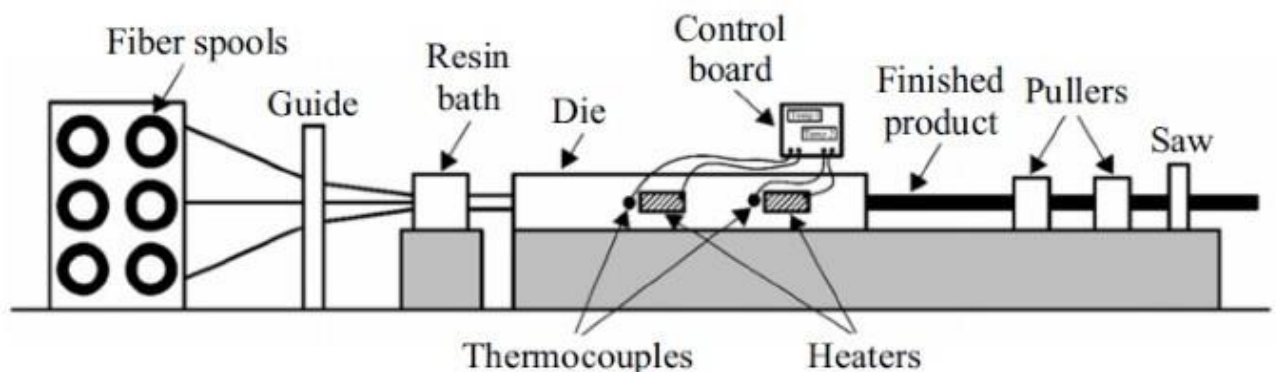
FEEDING FIBER REINFORCEMENT INTO THE GUIDE: The pultrusion process involves pulling fiberglass reinforcement through a heated die. These materials include continuous strand mats or rolls of filament (otherwise known as rovings). The first step is feeding the fiberglass materials into the pre-forming guide.

RESIN IMPREGNATION: Once brought together in the guide, the fiberglass fibers undergo resin impregnation. Traditionally this is done by moving the fibers through a wet-out bath of polymer. The mixed polymer consists of a resin, pigments, fillers, and curing catalyst. In some cases, the mixed resin is injected into the heated die saturating the fiberglass reinforcement.

HEATED DIE: After passing through the wet-out bath, the reinforced fibers pass through a heated die. This is the step where the fibers begin to solidify into their final shape, as the heat initiates the cross-linking process within the impregnated reinforcements.

SEPARATION FROM THE DIE: Near the end of the heating process, the temperature of the resin will become higher than the temperature of the die. This begins the separation process. Manufacturers use a pulling mechanism to remove the cured profile from the die. Once separated, the profiles can be cut to the appropriate lengths and undergo secondary processing if necessary.

Process flow diagram



Life Cycle Assessment Calculation Rules

Declared unit description

1 metric ton of TU450 – vinyl ester 12" x 1/2" (305 mm x 12.7 mm) diameter round fibreglass reinforced polymer (FRP) pultruded utility pole manufactured at Creative Pultrusions.

System boundary

This cradle to gate EPD includes the processes covered in the manufacturing site and product stage A1 to A3.

Data sources, quality and allocation

The quantity used in the data collection for this EPD has been taken from production data of the vinyl ester 12" x 1/2" (305 mm x 12.7 mm) diameter round composite utility pole. The data collection period was 06/01/2021 through 05/31/2022. Total site data has been allocated to this product based on the total production of TU450-vinyl ester 12" x 1/2" diameter round composite utility poles as a percentage of the overall total production at Creative Pultrusions Inc., Alum Bank site, which resulted in a value of 4.53%. The 4.53% represents the percentage of total site energy, fuels, and ancillary materials used for this product. The total site water and residual wastes has been allocated to this product based on the percentage of employees designated to production of TU450, which resulted in a value of 6.4%.

Datasets are derived from ecoinvent v3.2 (2015) and the LCA tool used was BRE LINA v2.0. The LCA models and reports the production stage modules, A1 to A3. A1 to A3 represents raw material supply, transport, and manufacturing. No inputs or outputs have been excluded, all the ancillary materials, energy, and water use are included. The only exemptions are emissions to water and soil. Emissions to air were calculated per 40 CFR Part 63 subpart WWWW.

Waste has been calculated based on the total amount of vinyl ester 12" x 1/2" diameter round composite utility pole scrap plus 6.4% the residual waste. A general assumption has been made that wastewater to sewer is equal to mains water.

Secondary data has been obtained for all other upstream and downstream processes that are beyond the control of the manufacturer (i.e., raw material production) from the ecoinvent 3.2 database. All ecoinvent datasets are complete within the context used and conform to the system boundary and the criteria for the exclusion of inputs and outputs, according to the requirements specified in EN15804.

Specific European and UK datasets have been used selected from the ecoinvent LCI and electricity US dataset were used for this LCA. The quality level of geographical and technical representativeness is therefore very good. The quality level of time representativeness is fair as the background LCI datasets are based on ecoinvent v3.2 which was compiled in 2015. Therefore, there is approximately 5-6 years between the ecoinvent LCI reference year and the time period for which the LCA was undertaken.

Cut-off criteria

All raw materials, ancillary materials, process energy, general energy, water use/discharge and production waste have been included. The only exemptions are emission to soil and water as these are not required to be monitored in our EPA reporting.

LCA Results

Parameters describing environmental impacts			GWP	ODP	AP	EP	POCP	ADPE	ADPF
			kg CO2 equiv.	kg CFC 11 equiv.	kg SO2 equiv.	kg (PO4)3- equiv.	kg C2H4 equiv.	kg Sb equiv.	MJ, net calorific value.
Product stage	Raw material supply	A1	2.67E+03	1.84E-04	1.84E+01	4.39E+00	1.75E+00	2.73E-01	4.45E+04
	Transport	A2	1.20E+02	2.24E-05	5.42E-01	1.41E-01	8.86E-02	3.02E-04	1.85E+03
	Manufacturing	A3	1.35E+02	1.34E-05	5.53E-01	7.22E-01	1.01E-01	9.27E-05	2.31E+03
	Total (of product stage)	A1-3	2.93E+03	2.19E-04	1.95E+01	5.26E+00	1.94E+00	2.73E-01	4.86E+04

GWP = Global Warming Potential;
 ODP = Ozone Depletion Potential;
 AP = Acidification Potential for Soil and Water;
 EP = Eutrophication Potential;

POCP = Formation potential of tropospheric Ozone;
 ADPE = Abiotic Depletion Potential – Elements;
 ADPF = Abiotic Depletion Potential – Fossil Fuels;

Parameters describing resource use, primary energy			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
Product stage	Raw material supply	A1	2.60E+03	6.90E+00	2.61E+03	4.27E+04	6.19E+03	4.89E+04
	Transport	A2	2.65E+01	8.89E-05	2.66E+01	1.84E+03	0.00E+00	1.84E+03
	Manufacturing	A3	3.56E+02	5.89E-05	3.56E+02	2.82E+03	0.00E+00	2.82E+03
	Total (of product stage)	A1-3	2.99E+03	6.90E+00	2.99E+03	4.73E+04	6.19E+03	5.35E+04

PERE = Use of renewable primary energy excluding renewable primary energy used as raw materials;
 PERM = Use of renewable primary energy resources used as raw materials;
 PERT = Total use of renewable primary energy resources;

PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials;
 PENRM = Use of non-renewable primary energy resources used as raw materials;
 PENRT = Total use of non-renewable primary energy resource

Parameters describing resource use, secondary materials and fuels, use of water			SM	RSF	NRSF	FW
			kg	MJ net calorific value	MJ net calorific value	m ³
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	4.66E+01
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	4.19E-01
	Manufacturing	A3	0.00E+00	0.00E+00	0.00E+00	6.85E-01
	Total (of product stage)	A1-3	0.00E+00	0.00E+00	0.00E+00	4.77E+01

SM = Use of secondary material;
 RSF = Use of renewable secondary fuels;

NRSF = Use of non-renewable secondary fuels;
 FW = Net use of fresh water

Other environmental information describing waste categories

			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	5.65E+01	1.74E+02	1.15E-01
	Transport	A2	7.81E-01	1.12E+02	1.27E-02
	Manufacturing	A3	4.69E-01	3.65E+01	1.22E-02
	Total (of product stage)	A1-3	5.78E+01	3.22E+02	1.40E-01

HWD = Hazardous waste disposed;
 NHWD = Non-hazardous waste disposed;
 RWD = Radioactive waste disposed

Other environmental information describing output flows – at end of life

			CRU	MFR	MER	EE
			kg	kg	kg	MJ per energy carrier
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Total (of product stage)	A1-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00

CRU = Components for reuse;
 MFR = Materials for recycling

MER = Materials for energy recovery;
 EE = Exported Energy

Interpretation of results

The bulk of the environmental impacts and primary energy demand are attributed to the upstream manufacturing process of the pultruded utility pole, covered by information modules A1-A3 of EN15804:2012+A1:2013.

Product calculations

The LCA results listed in the tables above are for 1 metric ton of Round Pole TU450 12"x1/2" (305mm x 12.7mm). The end-user of this EPD can therefore use these results to calculate impact of pole per meter or per pole by dividing the impacts “per m” as follows,

Product	Length (m)	Weight (kg)	Kg/m	GWP Impacts/m
TU450.3D7 – 1 Pole	15.24	382.3784	25.0904	1.17E+02

References

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- ASTM D5379 – Shear Properties of Composite Materials by the V-Notched Beam Method
- ASTM D570 – Standard Test Method for Water Absorption of Plastics
- ASTM E-84 – Standard Test Method for Surface Burning Characteristics of Building Materials
- ASTM F-711 – Standard Specification for Fiberglass-Reinforced Plastic (FRP) Rod and Tube Used in Live Line Tools
- IEEE978 – Guide for In-Service Maintenance and Electrical Testing of Live-Line Tools