ENVIRONMENTAL PRODUCT DECLARATION

PANDUIT 4-PAIR COPPER DATA CABLE

PLENUM RATED

Panduit TX Series Plenum Copper Cabling

PANDUIT®
infrastructure for a connected world

At Panduit, we're serious about sustainability.
Everyone's talking about sustainability these days. Companies are making huge changes in the way they do business to meet the demands for energy efficiency, meet environmental standards and exceed international benchmarks.

At Panduit, sustainability drives our business practices. We are committed to providing you with the most cost-efficient and environmentally sound solutions available. Because sustainable business practices have always been at the core of what we do, it's a natural progression for us to create award-winning solutions that put sustainable business at the foundation of your infrastructure, too.

We walk the talk.
Our world headquarters, a LEED Gold Certified building, is a testament to our commitment to design and implement healthy, energy efficient, and sustainable business environments. Through our experience and expertise, we can help you build an infrastructure that can contribute toward your projects' LEED certification.

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ENVIRONMENTAL PRODUCT DECLARATION

PANDUIT®

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Panduit Category 6A U/UTP Advanced MaTriX; Panduit Category 6A U/FTP (STP); Panduit Category 6A F/UTP; Panduit Category 6A U/UTP Small Diameter MaTriX

4-pair Copper Plenum Data Cable

According to ISO 14025

This declaration is an environmental product declaration (EPD) in accordance with ISO 14025 and ISO 21930. EPDs rely on Life Cycle Assessment (LCA) to provide information on a number of environmental impacts of products over their life cycle. Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc. Accuracy of Results: EPDs regularly rely on estimations of impacts, and the level of accuracy in estimation of effect differs for any particular product line and reported impact. Comparability: EPDs are not comparative assertions and are either not comparable or have limited comparability when they cover different life cycle stages, are based on different product category rules or are missing relevant environmental impacts. EPDs from different programs may not be comparable.

PROGRAM OPERATOR	UL Environment
DECLARATION HOLDER	Panduit
DECLARATION NUMBER	4787339353.102.1
DECLARED PRODUCT	Plenum Rated 4-Pair Copper Data Cable
REFERENCE PCR	PCR for EPDs: Wire & Cable PCR 2013:1.0
DATE OF ISSUE	March 31, 2016
PERIOD OF VALIDITY	5 years
CONTENTS OF THE DECLARATION	Product definition and information about building physics Information about basic material and the material's origin Description of the product's manufacture Indication of product processing Information about the in-use conditions Life cycle assessment results Testing results and verifications

The PCR review was conducted by:	Environment and Development Foundation PCR Addendum: UL Environment
This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories ☒ INTERNAL ☐ EXTERNAL	Wade Stout, ULE EPM
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Thomas Gloria, Life-Cycle Services, LLC

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4-pair Copper Plenum Data Cable

According to ISO 14025

Product Definition and Information

Company Description

Panduit is a world-class developer and provider of leading-edge electrical and networking solutions that help customers optimize the physical infrastructure.

Product Description

Plenum cables are installed in the plenum spaces of buildings and must meet associated fire safety test standards. In this declaration, three premises 4-pair plenum copper data cable products are covered. All products listed below are UL Listed CMP and have been UL or ETL verified as Category 6A products.

Panduit Category 6A U/UTP Advanced MaTriX, Part number: PUP6AM04**-UG
Category 6A, plenum (CMP), 4-pair, U/UTP copper cable. Copper conductors are 23 AWG with FEP insulation. Conductors are twisted in pairs, separated by an integrated pair divider, surrounded by the Advanced MaTriX tape and protected by a low smoke, flame retardant PVC jacket.

Panduit Category 6A U/FTP (STP), Part number: PUFP6X04**-UG
Category 6A, plenum (CMP), 4-pair, U/FTP shielded copper cable. Copper conductors are 23 AWG with FEP insulation. Conductors are twisted in pairs, each covered by a metallic foil shield, separated by an integrated pair divider and protected by a low smoke, flame retardant PVC jacket.

Panduit Category 6A F/UTP (ScTP), Part number: PFP6X04**-UG
Category 6A, plenum (CMP), 4-pair, F/UTP shielded copper cable. Copper conductors are 23 AWG with FEP insulation. Conductors are twisted in pairs, separated by an integrated pair divider, surrounded by an overall metallic foil shield and protected by a low smoke, flame retardant PVC jacket.

Panduit Category 6A U/UTP Small Diameter MaTriX, Part number: PUP6ASD04**-UG
Category 6A, plenum (CMP), 4-pair, U/UTP copper cable. Copper conductors are 26 AWG with FEP insulation. Conductors are twisted in pairs, separated by an integrated pair divider, surrounded by the MaTriX tape and protected by a low smoke, flame retardant PVC jacket.

** denotes color code

Manufacturing Locations

These data cables are manufactured in the Southeastern region of the United States. Primary data for the life cycle assessment has been provided by each of these facilities and a weighted average has been conducted for each product.

Applications and Uses

These products are used in the plenum spaces of buildings. Applications for the plenum products include IEEE 802.3: 10 through 10GBASE-T LAN and WLAN applications; Power over Ethernet – 802.3AF (PoE), 802.3at (PoE+); HDBT and digital video; broadband and baseband analog video; CDDI, Token Ring, ATM.

Material Inputs

The raw materials for these plenum data cables are listed in Table 1. Table 2 details the average packaging materials associated with each product.

Material (lb/100ft)	Panduit CAT 6A U/UTP Advanced MaTriX	Panduit CAT 6A U/FTP (STP)	Panduit CAT 6A F/UTP (ScTP)	Panduit CAT 6A U/UTP Small Diameter MaTriX
Copper	1.4	1.4	1.5	0.7
FEP Compound	0.8	1.1	0.7	0.7
PET	0.6	1.1	0.8	0.4
Tin	-	0.1	0.1	-
PVC Compound	0.9	1.5	1.0	0.8
Colorant	<0.1	<0.1	<0.1	<0.1
Total	3.7	5.3	4.1	2.6

Table 1: Material Inputs for Plenum Copper Data Cables

Material (lb/100ft)	Panduit CAT 6A U/UTP Advanced MaTriX	Panduit CAT 6A U/FTP (STP)	Panduit CAT 6A F/UTP (ScTP)	Panduit CAT 6A U/UTP Small Diameter MaTriX
Cardboard	0.1	0.1	0.1	0.1
Plastic Spool	0.4	0.4	0.4	0.4
Wood Pallet	0.4	0.4	0.4	0.4
Shrinkwrap	<0.1	<0.1	<0.1	<0.1

Table 2: Average Packaging Material Inputs

Manufacturing Process

Copper wire goes through two drawing processes with an immediate subsequent annealing process. The wire continues down the line to an extruder where the insulation material is applied to the wire. Cooling and drying of the insulated wire then occurs. Two of these insulated wires are then twinned together around each other. Four twinned wire pairs, along with other cable components such as separator tape and/or shielding material, are then bunched together. Subsequently, the bunched wire has a jacket extruded around the bunched cable. After the jacket is applied, the cable is cooled and packaged. Various packaging options exist, but most product is shipped in 1000-foot length spools and/or boxes.

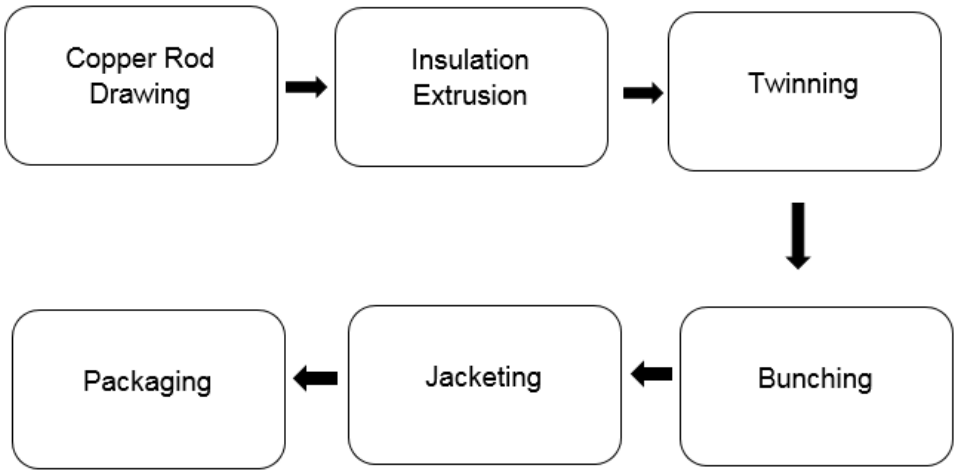

Figure 1: Manufacturing Process Flow of Copper Data Cable

Life Cycle Assessment Description

Functional Unit

Environmental impacts are reported per functional unit of a product and the functional unit is the basis for comparison in an LCA. For copper data cable, the functional unit is 100ft of cable.

Life Cycle Stages Assessed

Life Cycle Boundary	EPD Life Cycle Stage
Panduit Plenum Cable Business-to-Business	Raw Material Acquisition
	Manufacturing
	Packaging/Storage
Panduit Plenum Cable Business-to-Consumer	Marketing and Distribution
	Installation and Use
	Waste Disposal

Table 3: Life Cycle Stages Assessed

System Boundary

This project considers the life cycle activities from resource extraction through installation and end-of-life effects. The boundary covers raw material acquisition, manufacturing, marketing, use and waste disposal as seen in Figure 2.

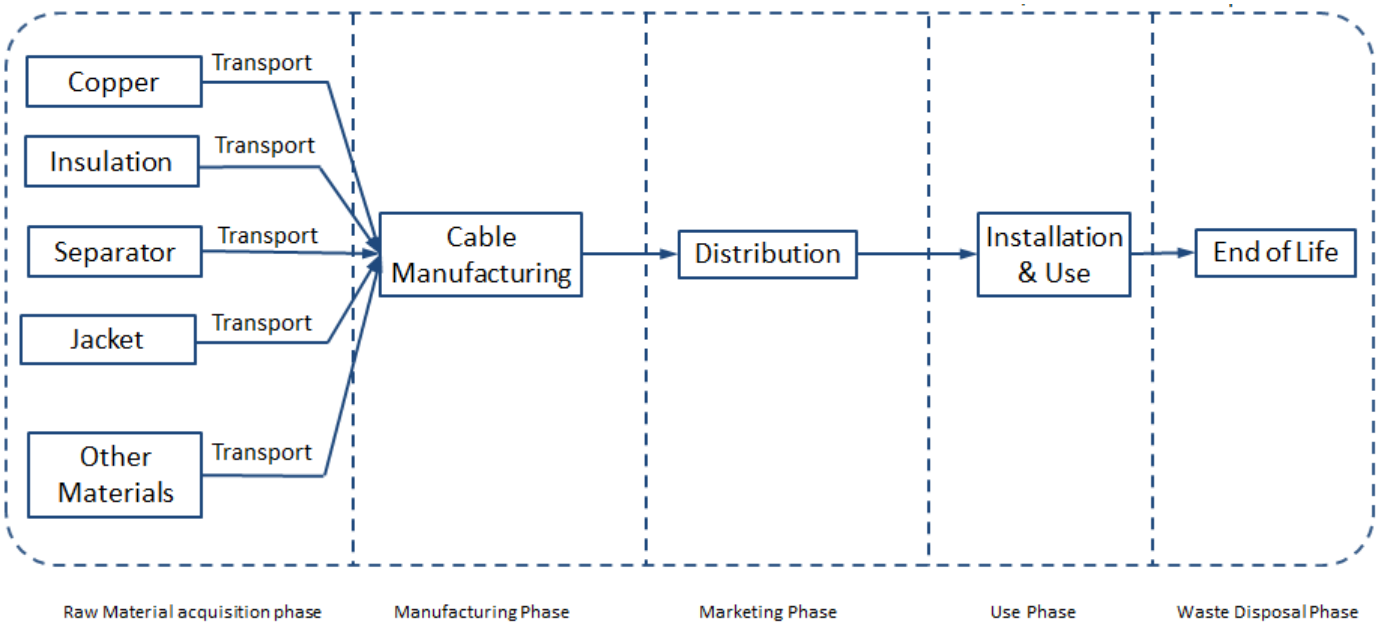

Figure 2: System Boundary

Allocation

Allocation for manufacturing energy, water, and waste items was conducted per length of production based on manufacturing zones of each facility.

Cut-off Criteria

For any impact category, should the sum of various impacts from a specific process/activity be less than 1% of the impact equivalent in that category, the process/activity may be neglected during the inventory analysis. Nonetheless, the accumulated impact of neglected process/activity may not exceed 5%. Components and materials omitted from the LCA shall be documented.

This EPD is in compliance with the cut-off criteria. Components and materials omitted from the LCA shall be documented and include installation energy from signal testing devices in the installation of data communication cable. Capital items for the production processes (machines, buildings, etc.) were not taken into consideration.

Period under Consideration

Primary data used refer to the production processes of the manufacturing facility and were derived from calendar year 2014.

Software and Background Data

SimaPro v8.02 Software System for Life Cycle Engineering, an internationally recognized LCA modeling software program, was used for life cycle impact assessment modeling. Background and secondary datasets were modeled using the US LCI database, developed by the National Renewable Energy Laboratory, as well as the ecoinvent v3 database, which is developed by the Swiss Centre for Life Cycle Inventories. FEP material impact data was obtained from an LCA on data cable conducted for the Environmental Protection Agency.

Marketing and Distribution

The plenum cable products are distributed globally, but primarily throughout the United States and Canada. Final plenum copper data cable products were modeled as being shipped 1000 miles by truck, based on the location of Panduit manufacturing locations and distribution centers.

Transportation

Panduit provided resource transportation mode and location data to support the calculation of raw material transportation flows. The transportation LCI data from the US LCI database (kg-km basis) were used to develop the resource transportation LCI profile.

Installation and Use Stage

A scrap rate of 5% was assumed in the installation of the product in the use stage for this study. This rate was based on the expertise of Panduit. Installers routinely use signal testing devices to ensure cable has been installed properly; however, this device has negligible energy consumption compared to the rest of the installation and life cycle impacts and so was excluded from the study as allowed by the cut-off criteria.

The lifetimes of these products are widely variable and most often data cable is replaced due to increased bandwith and data speed requirements, and not because of product performance or degradation. Copper data cable is a passive product after installation and during the use stage, meaning no energy is consumed nor additional maintenance is requried during the products' use. Therefore, no use stage impacts were measured, and thus none are presented in these results.

End-of-Life

A distance of 20 miles to the recycling facility was assumed for products at the end-of-life. A 95% recycling rate was assumed with the remaining 5% being disposed as the average US municipal solid waste disposition, as cited in a study conducted by DuPont (Krieger, 2007). The US disposition rates of 82% landfill and 18% incineration were assumed for the remaining 5% of product material. The cut-off methodology (also known as the recycled content method) was used for any materials that were sent to recycling such as scrap and the end-of-life disposition. This methodology assumes the processing of the recycled material at the recycler will be applied to the next product life cycle. Data not available in life cycle databases used models found in the Waste Reduction Model (WARM), developed by the US EPA.

Life Cycle Inventory

Energy Use

The following table and figure details the cumulative energy demand of the Panduit plenum copper cables through each life cycle stage of the product.

Life Cycle Stage	Panduit CAT 6A U/UTP Advanced MaTriX	Panduit CAT 6A U/FTP (STP)	Panduit CAT 6A F/UTP (ScTP)	Panduit CAT 6A U/UTP Small Diameter MaTriX
Raw Material Acquisition	193	310	244	115
Manufacturing	36.9	38.3	38.3	36.9
Marketing	12.1	19.9	17.3	9.7
Use	12.1	18.4	15.0	8.1
Waste Disposal	0.1	0.2	0.1	0.1
Total Cradle-to-Grave	255	387	315	170

Table 4: Cradle-to-Grave Cumulative Energy Demand (MJ) per 100 feet of Cable

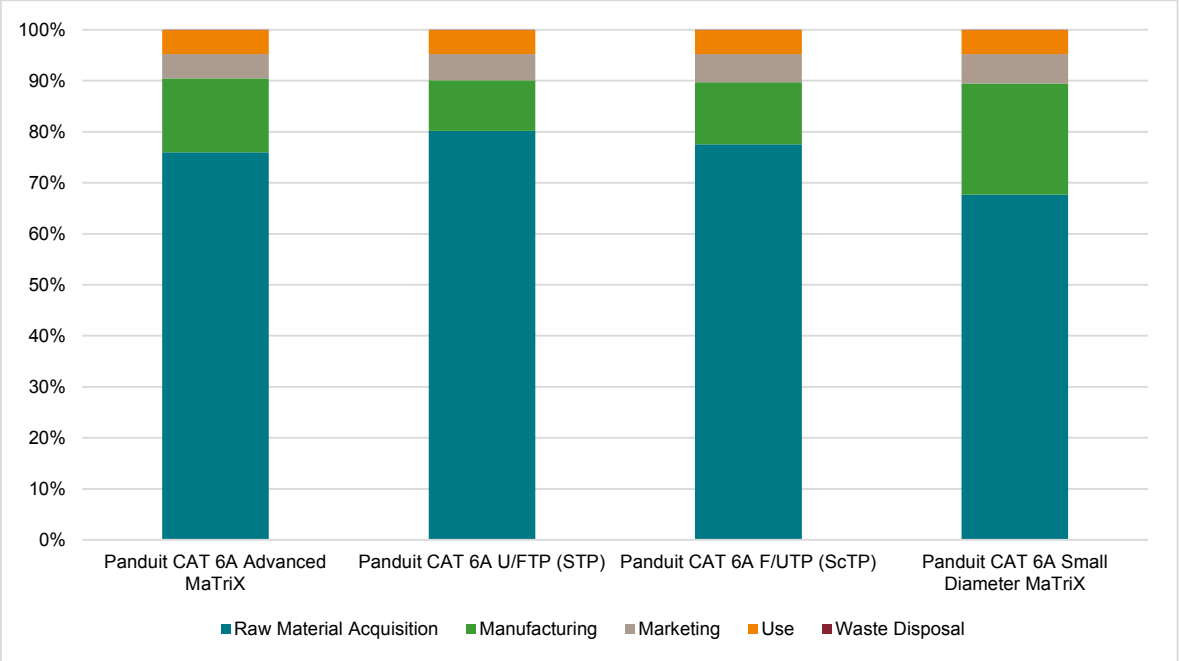

Figure 3: Cradle-to-Grave Cumulative Energy Demand

Waste Management

Methods of waste handling is detailed for the Panduit plenum copper cables for the entire life cycle of the products per 100 feet of cable.

Waste Type	Panduit CAT 6A U/UTP Advanced MaTriX	Panduit CAT 6A U/FTP (STP)	Panduit CAT 6A F/UTP (ScTP)	Panduit CAT 6A U/UTP Small Diameter MaTriX
Incineration (with and without energy recovery)	3.6E-04	5.9E-04	4.1E-04	3.0E-04
Landfill (nonhazardous waste)	2.1E+00	2.5E+00	2.4E+00	1.1E+00
Hazardous Waste	3.3E-02	5.2E-02	3.3E-02	3.1E-02
Landfill Avoidance (recycling)	1.7E+00	2.3E+00	1.8E+00	1.2E+00

Table 5: Cradle-to-Grave Waste (kg) per 100ft of Cable

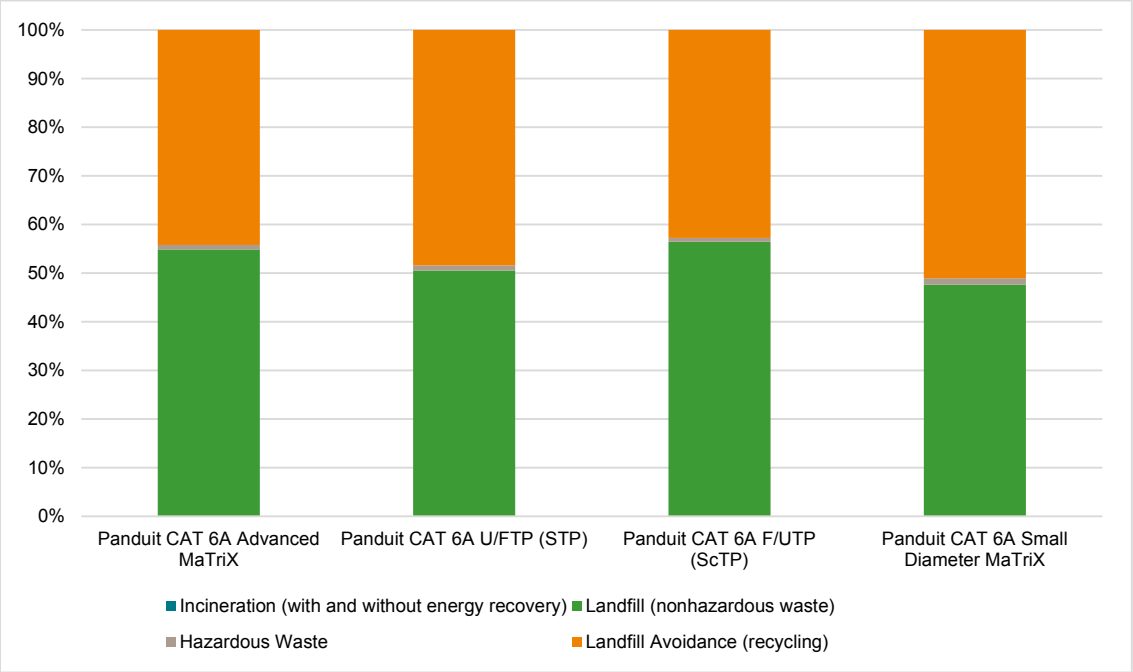

Figure 4: Cradle-to-Grave Waste

Life Cycle Impact Assessment

The environmental impacts listed below were assessed throughout the life cycle of the plenum data cable products as defined above, per 100 feet of cable. The environmental impacts were analyzed using TRACI 2.1 methodology.

Impact Category	Panduit CAT 6A U/UTP Advanced MaTriX						Panduit CAT 6A U/FTP (STP)						Panduit CAT 6A F/UTP (ScTP)					
	Raw Material	Manufacturing	Marketing	Use	Waste Disposal	Cradle to Grave	Raw Material	Manufacturing	Marketing	Use	Waste Disposal	Cradle to Grave	Raw Material	Manufacturing	Marketing	Use	Waste Disposal	Cradle to Grave
Global Warming (kg CO_2 eq)	1.1E+01	1.9E+00	8.9E-01	7.0E-01	3.1E-02	1.5E+01	1.8E+01	2.0E+00	1.5E+00	1.1E+00	4.5E-02	2.2E+01	1.4E+01	2.0E+00	1.3E+00	8.7E-01	3.8E-02	1.8E+01
Acidification (kg SO_2 eq)	3.1E-01	1.7E-02	5.2E-03	1.6E-02	5.0E-05	3.5E-01	3.6E-01	1.8E-02	8.7E-03	1.9E-02	7.6E-05	4.0E-01	3.6E-01	1.8E-02	7.5E-03	1.9E-02	5.9E-05	4.0E-01
Eutrophication (kg N eq)	1.3E+00	6.6E-04	3.6E-04	6.4E-02	2.6E-05	1.3E+00	1.4E+00	8.4E-04	6.0E-04	7.2E-02	4.0E-05	1.5E+00	1.5E+00	8.4E-04	5.2E-04	7.4E-02	3.0E-05	1.6E+00
Smog (kg O_3 eq)	1.6E+00	1.2E-01	1.4E-01	9.4E-02	9.9E-04	2.0E+00	1.9E+00	1.3E-01	2.4E-01	1.1E-01	1.4E-03	2.4E+00	1.9E+00	1.3E-01	2.1E-01	1.1E-01	1.2E-03	2.3E+00
Ozone Depletion (kg CFC-11 eq)	6.5E-05	4.8E-08	1.5E-08	3.3E-06	5.3E-10	6.8E-05	1.4E-04	5.4E-08	2.4E-08	6.8E-06	8.0E-10	1.4E-04	9.1E-05	5.4E-08	2.1E-08	4.6E-06	6.2E-10	9.6E-05

Impact Category	Panduit CAT 6A U/UTP Small Diameter MaTriX					
	Raw Material	Manufacturing	Marketing	Use	Waste Disposal	Cradle to Grave
Global Warming (kg CO_2 eq)	6.1E+00	1.9E+00	7.1E-01	4.4E-01	2.1E-02	9.2E+00
Acidification (kg SO_2 eq)	1.7E-01	1.7E-02	4.2E-03	9.5E-03	3.4E-05	2.0E-01
Eutrophication (kg N eq)	6.2E-01	6.6E-04	2.9E-04	3.1E-02	1.7E-05	6.5E-01
Smog (kg O_3 eq)	8.7E-01	1.2E-01	1.2E-01	5.5E-02	6.6E-04	1.2E+00
Ozone Depletion (kg CFC-11 eq)	2.5E-05	4.8E-08	1.2E-08	1.3E-06	3.6E-10	2.6E-05

Table 6: Cradle-to-Grave Life Cycle Impact Assessment Results per 100 ft of Cable

References

- ANSI/TIA-568-C.2 Commercial Building Telecommunications Cabling
- C22.2 NO. 214-08 (R2013) - Communications cables (Bi-national standard, with UL 444)
- ISO 21930: Sustainability in building construction – Environmental declaration of building products
- EPA, Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI)
- EPA, Wire and Cable Insulation and Jacketing: Life-Cycle Assessments for Selected Applications, June 2008, EPA 744-R-08-001
- FTC Part 260, Green guides
- (ILCD, 2010) Joint Research Commission, 2010, ILCD Handbook: General Guide for Life Cycle Assessment
- Intergovernmental Panel on Climate Change (IPCC)
- ISO 14025:2006 *Environmental labels and declarations – Type III environmental declarations – Principles and procedures*
- ISO 14040:2006 *Environmental management - Life cycle assessment – Principles and framework*
- ISO 14044:2006 *Environmental management - Life cycle assessment – Requirements and guidelines*
- NFPA 262: Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces
- NFPA 70®: National Electrical Code
- UL 44 Standard Thermoset-Insulated Wires and Cables
- UL 1666 Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
- USEPA Waste Reduction Model (WARM)
- Krieger, T. et al. *New Fire Hazard and Environmental Burden Evaluations of Electrical Cable Installations Utilizing ISO 14040 Environmental Methodologies*. DuPont. November 10, 2007.

LCA Development

This EPD and corresponding LCA were prepared by Sustainable Solutions Corporation of Royersford, Pennsylvania.

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