FIRE-TROL
PREFABRICATED FIREPROOF COLUMNS

Prefabricated Fireproof Columns

Fire-Trol®
A division of United Steel Inc.

ENVIRONMENTAL PRODUCT DECLARATION

ISO 14025:2006 and ISO 21930:2017

ASTM INTERNATIONAL

Fire-Trol®, a division of United Steel Inc., is pleased to present this Environmental Product Declaration (EPD) for fireproof columns (OH, OO, OS, SH and SS models). This EPD was developed in compliance with ISO 14025 and ISO 21930 and has been verified by Lindita Bushi, Ph.D., Athena Sustainable Materials Institute.

The LCA and the EPD were prepared by Vertima Inc. The EPD includes cradle-to-gate life cycle assessment (LCA) results.

For more information about Fire-Trol®, visit www.Fire-Trol.com

For any explanatory material regarding this EPD, please contact the program operator.

1. GENERAL INFORMATION

PCR GENERAL INFORMATION			
Reference PCR	PCR Part B: Designated Steel Construction Product EPD Requirements (UL10010-34), v.2.0 and its core PCR Part A: Life Cycle Assessment Calculation Rules and Report Requirements (UL-10010), v.4.0 UL Environment August 25, 2020 to August 25, 2025 (validity period of PCR Part B) March 28, 2022 to March 28, 2027 (validity period of PCR Part A)		
The PCR review was conducted by:	*Thomas Gloria, PhD (chair)* *Industrial Ecology Consultants* *t.gloria@industrial-ecology.com*	*Brandie Sebastian* *JBE Consultants*	*James Littlefield* *Independent Consultant*

EPD GENERAL INFORMATION		
Program Operator	ASTM International 100 Barr Harbor Drive, West Conshohocken, PA 19428 USA www.astm.org	
Declared Product	**Fire-Trol® Fireproof Columns (OH, OO, OS, SH, and SS models)**	
EPD Registration Number 1059	**EPD Date of Issue** August 22, 2025	**EPD Period of Validity** 5 Years
EPD Recipient Organization	Fire-Trol® 164 School St, East Hartford, CT 06108 USA www.Fire-Trol.com	

EPD Type/Scope and Declared Unit	**Year of Reported Manufacturer Primary Data**
Product-specific cradle-to-gate EPD with declared unit of 1 metric ton.	2023

Geographical Scope	**LCA Software**	**LCI Databases**	**LCIA Methodology**
North America	OpenLCA v.2.1	Ecoinvent 3.9.1 and US LCI	TRACI 2.1 and IPCC AR5

This LCA and EPD were prepared by:	Olutoyin Rahimy, M.Sc. Vertima Inc. www.vertima.ca
This EPD and LCA were independently verified in accordance with ISO 14025:2006, ISO 14040:2006 ISO 14044:2006, and ISO 21930:2017, as well as the UL Environment PCR "Part B: Designated Steel Construction Product EPD Requirements (UL 10010-34), v.2.0", and PCR "Part A: Life Cycle Assessment Calculation Rules and Report Requirements (UL-10010), v.4.0", which serves as the core PCR. ☐ Internal ☒ External	Lindita Bushi Lindita Bushi, Ph.D. Athena Sustainable Materials Institute

The owner of the declaration shall be liable for the underlying information and evidence; ASTM, or its affiliates, shall not be liable with respect to manufacturer information, life cycle assessment data, and evidence.

LIMITATIONS

Environmental declarations from different programs within the same product category may not be comparable. [1]

The comparison of the environmental performance of construction projects and products using EPD information shall be based on the product's use and impacts at the construction projects level. Generally, EPDs cannot be used for comparison purposes outside of a construction project context. [2]

When comparing EPDs created using this PCR, variations and deviations may occur. An example of a variation is: Using different LCA software or background LCI datasets may produce different results at different stages (upstream and downstream) of the life cycle. [2]

The environmental impact results of Fire-Trol® fireproof column products in this document are based on a declared unit of a steel product. Therefore, they do not provide sufficient information for wide comparisons. These results should not be used for comparison purposes without understanding how the physical properties of fireproof columns impact the precise function at the construction level. Any comparison must be made on a functional unit basis. [2]

Green columns – Surfside Hotel, Lake George, NY (Photo courtesy of Fire-Trol®)

2. PRODUCT SYSTEM DESCRIPTION

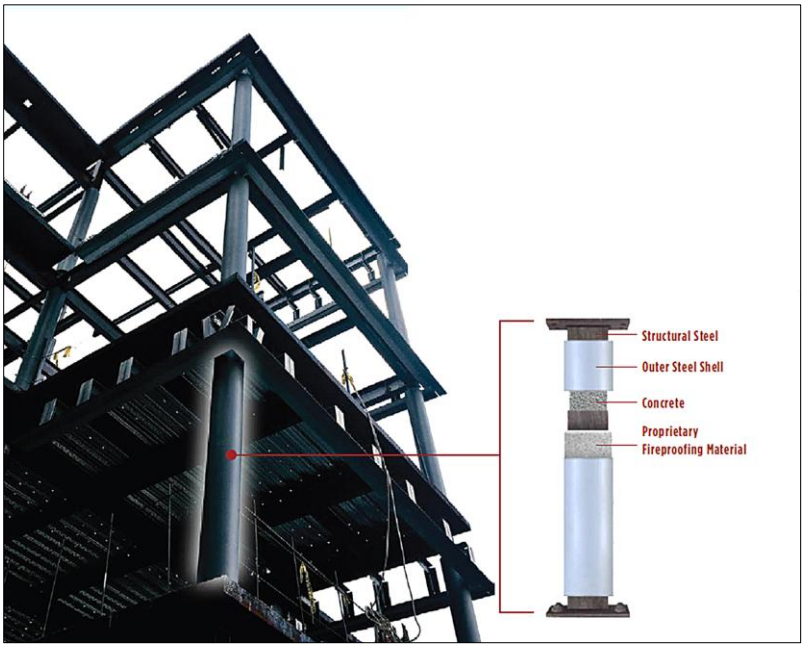
Since 1961, Fire-Trol® Corporation has been the first company to offer pre-fireproofed columns ready for erection upon arrival at the jobsite. Following its establishment in 1933, Lally Bros., a company specializing in concrete-filled steel columns, became Fire-Trol®. At Fire-Trol®, a division of United Steel Inc., our expertise and passion lie in stylish exposed steel columns with high-performance fire protection. Fireproof columns decrease long-term maintenance costs and increase durability and security, thanks to their American Institute of Steel Construction (AISC)-approved structural fireproof protection.

2.1. PRODUCT DESCRIPTION

Prefabricated fireproof steel columns consist of load-bearing structural steel members encased in the manufacturer's standard insulating material for fire protection. They are enclosed in an outer, non-load-bearing steel shell in specified configurations. If the load-bearing structural steel member is a square or round HSS (hollow steel section), it will be filled with concrete. Fire-Trol® columns are available in round, square, and rectangular profiles and can be customized in terms of shape and size.

The catalog of fireproof column configurations is as follows: OH [Round shell casing with an interior H-flange structural column]; OO [Round shell casing with an interior round structural column]; OS [Round shell casing with an interior square structural column]; SH [Square shell casing with an interior H-flange structural column]; SO [Square shell casing with an interior round structural column]; SS [Square shell casing with an interior square structural column]; RH [Rectangular shell casing with an interior H-flange structural column]; and RR [Rectangular shell casing with an interior rectangular flange structural column].

The Product Construction Specification Institute (CSI) Master format code for Fire-Trol® fireproof columns is 051216.



Fire-Trol® fireproof column description (Photo courtesy of Fire-Trol®)

Product Identification

The Fire-Trol® products that were studied include the following fireproof column models: OH, OO, OS, SH, and SS. These models are based on the following specifications: OH-2HRW12x72, OO-2HRPIPE10SCH40, OS-2HRHSS8x8x1/2, SH-2HRHSS8x8x1/2, and SS-2HRHSS8x8x1/2. All of these models were manufactured at the facility located at 164 School St., East Hartford, CT 06108 USA.

Product specifications

The specifications of Fire-Trol® fireproof columns are presented in the table below. Although the weight of each column depends on its dimensions, an average weight has been calculated for each product using a mass ratio based on 2023 production data.

Item	Unit	OH-2HRW12x72	OO-2HRPIPE10SCH40	OS-2HRHSS8x8x1/2	SH-2HRHSS8x8x1/2	SS-2HRHSS8x8x1/2
Core size	-	W12x72	PIPE10SCH40	HSS8x8x1/2	W12X72	HSS8x8x1/2
Shell size	-	PIPE20SCH10	PIPE14SCH10	PIPE14SCH10	TS16x16x0.313	HSS12x12x0.313
Weight / foot	lbs/ft	250	183	172	235	178
Product average weight	ton	2.24	1.51	1.55	2.14	1.69

Technical Data

Fire-Trol® fireproof columns comply with UL test performances R3966 and R8199, which are valid for the product's lifetime. The manufacturer's one-year (1) warranty, from the date of completion, covers defects in materials.

For the specific properties and performance data of Fire-Trol® fireproof columns, please refer to the following link: https://fire-trol.com/product-shapes/ .

2.2. PRODUCT APPLICATION

Fire-Trol® columns are prefabricated fireproof columns used in commercial construction projects. They are an aesthetically pleasing way to protect the structural steel in architecturally exposed areas of buildings such as hospitals, schools, dormitories, cafeterias, shopping centers, and countless other structures. Figure 1 provides an illustration.

Figure 1: Tall white columns – Skidmore College, Saratoga Springs, NY (Photo courtesy of Fire-Trol®)

2.3. MATERIAL COMPOSITION

The details of the raw materials used for manufacturing Fire-Trol® fireproof columns are listed below in Table 1. For more information about the specific contents of each material used, please refer to the Health Product Declaration (HPD) available at http://www.hpd-collaborative.org/hpd-public-repository/

Table 1: Composition of one (1) metric ton of the fireproof columns based on 2023 total production

	Composition of Fire-Trol® fireproof columns				
Materials / Components	OH	OO	OS	SH	SS
Steel pipe 1	15.61%	33.32%	19.61%	0.00%	0.00%
Steel pipe 2	3.28%	6.33%	1.03%	0.00%	0.00%
Steel pipe 3	2.50%	6.86%	0.78%	0.00%	0.00%
Steel tube 1	0.00%	0.00%	28.51%	29.26%	52.34%
Steel tube 2	0.00%	0.00%	0.00%	0.00%	0.00%
Steel tube 3	0.00%	0.00%	0.00%	0.00%	0.00%
Wide flange steel	29.20%	0.00%	0.00%	30.59%	0.00%
Concrete	0.00%	32.54%	29.77%	0.00%	36.16%
Cement	9.25%	3.92%	3.80%	7.51%	2.15%
Proprietary fireproofing formula	10.45%	4.43%	4.29%	8.49%	2.43%
Water	29.71%	12.60%	12.20%	24.15%	6.92%
TOTAL	100.00%	100.00%	100.00%	100.00%	100.00%

2.4. MANUFACTURING

Fire-Trol® fireproof columns are made of a steel and concrete mixture containing Portland cement, a proprietary fireproofing formula, aggregates, and other additives as needed. The concrete used to fill the columns is the manufacturer's standard mix of structural concrete with a minimum 28-day compressive strength of 4,000 psi (2.76E+04 kPa). It is machine-mixed and mechanically vibrated during placement to produce concrete fill that is void-free.

Surface preparation of the columns is according to SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning," and primer is applied to provide a dry film thickness of at least 1.5 mils (3.81E-02 mm). Priming must be done in accordance with the manufacturer's and Fire-Trol®'s written instructions. All welding and connections are performed during fabrication at our plant in Connecticut (CT). Fire resistance is indicated by the UL rating: X106 (2-hour rating); X104 (3-hour rating); and X101 (4-hour rating).

2.5. PACKAGING

All Fire-Trol® fireproof columns are shipped with oak wood dunnage, ready for delivery. Table 2 presents the specifications for the dunnage (size and density), the amount of dunnage per declared unit (DU), and the distance from the supplier to the Fire-Trol® plant.

Table 2: Specifications and amount of packaging materials for Fire-Trol® fireproof columns ready to ship

Materials	Unit	Quantity
Size of 1 oak dunnage	Inch or foot	3”x4”x9’
Oak density at 20°C	kg/m^3	7.52E+02
Dunnage (oak wood)	metric ton/DU	2.68E-01

Gray columns – SUNY ESF, Syracuse, NY (Photo courtesy of Fire-Trol®)

3. LCA CALCULATION RULES

3.1. DECLARED UNIT

The selected declared unit (DU) for this study is **one (1) metric ton** of Fire-Trol® fireproof column with a two-hour fire protection rating and varied configurations and components, with a reference service life (RSL) of 75 years according to UL PCR in Part B.

3.2. PRODUCTION AVERAGE

Basis on the 164 School St. East Hartford, CT (USA) facility's 2023 production data, the LCA results represent each Fire-Trol® fireproof column model (OH, OO, OS, SH, and SS), based on the most representative model: OH-2HRW12x72, OO-2HRPIPE10SCH40, OS-2HRHSS8x8x1/2, SH-2HRHSS8x8x1/2, and SS-2HRHSS8x8x1/2. Additionally, for models with similar material compositions, environmental impact indicators do not vary by more than ±10%.

3.3. SYSTEM BOUNDARIES

The system boundaries are **cradle-to-gate**, meaning they only cover the production life cycle stage as illustrated in Table 3. This life cycle stage considers three modules: A-1) Extraction and Upstream Production, A-2) Transport to Factory, and A-3) Manufacturing. The Construction (A-4 and A-5), Use (B-1 to B-7), and End-of-Life (C-1 to C-4) stages are not included in this study. Figure 2 presents the process flow diagram for Fire-Trol® fireproof columns. This EPD does not take into account the purchase of renewable energy certificates, biogas or CO_2 certificates.

Table 3: Description of the system boundary life cycle stages and related information modules

PRODUCTION STAGE			CONSTRUC-TION PROCESS STAGE		USE STAGE							END-OF-LIFE STAGE			
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
Extraction and Upstream Production	Transport to Factory	Manufacturing	Transport to Site	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	Deconstruction / Demolition	Transport to Waste Processing or Disposal	Waste Processing	Disposal of Waste
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

Key: X = included; MND = module not declared (excluded)

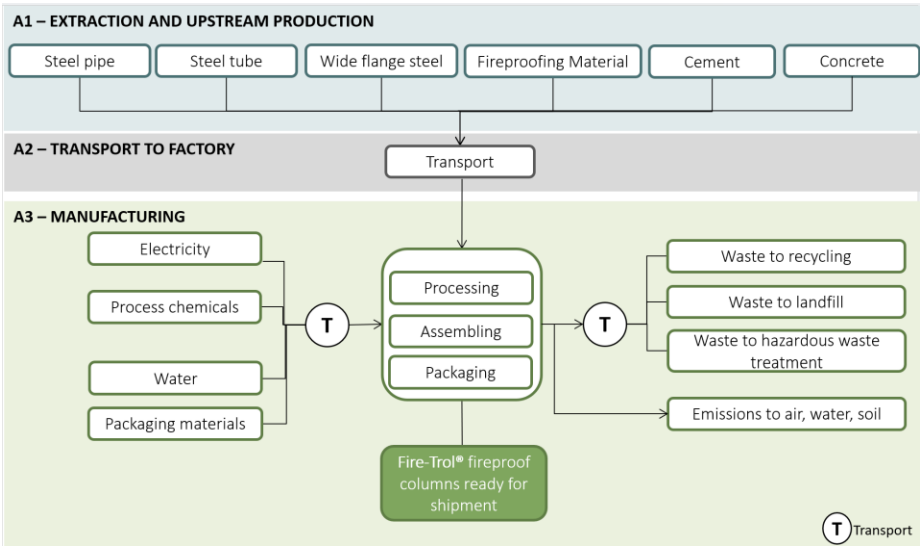


Figure 2: Cradle-to-Gate flow diagram for Fire-Trol® fireproof columns LCA

Production (modules A1 to A3)

Extraction and upstream production (module A1): This module includes the extraction and transformation of the raw materials necessary for producing Fire-Trol® fireproof column models OH, OO, OS, SH and SS.

Transport to the factory (module A2): This module includes the transportation of raw materials from the suppliers to Fire-Trol®'s facility located at 164 School St. East Hartford, CT 06108 (USA).

Manufacturing (module A3): This module includes the consumption of energy (electricity, diesel, gasoline), chemicals, water and packaging materials to make the product ready for shipment as well as their transport to Fire-Trol®.

3.4. CUT-OFF CRITERIA

The exclusion criteria for inputs and outputs (cut-off rules) in the LCA should not be used to hide data. According to UL Environment PCR – Part B, [2] all known mass and energy flows must be reported.

In this study, no known flows were excluded from the EPD.

Please note that the system boundaries do not include data on the construction, maintenance, or dismantling of capital assets; the daily transportation of employees; office work; business trips; or other activities of Fire-Trol® employees. The model only considers processes associated with infrastructures already included in the ecoinvent unit processes.

3.5. ALLOCATION

According to UL Environment PCR – Part B [2], the mass allocation approach should be used as the primary basis for allocating co-products. Other allocation methods may be used when justified, but the mass allocation approach is preferred. In this EPD, the mass allocation approach was used to partition the inputs and outputs of the production process. Waste processing of material flows undergoing recycling processes is included up to the end-of-waste system boundary. A cut-off approach was used for materials undergoing recycling or reuse because they become part of the raw materials for another product system. However, transportation to the recycling center has been accounted for.

3.6. DATA SOURCES AND QUALITY REQUIREMENTS

Data Quality Parameter	Data Quality Discussion
Source of manufacturing data	Manufacturing data was collected from the Fire-Trol® fireproof column manufacturing plant in East Hartford, Connecticut, USA, for the 2023 production year. This data included the total annual mass of products produced at the manufacturing plant, the total production of each product under study, and the specific product composition. It also included the raw materials used to produce the products under study, material losses, the mode and distance of material transport, electricity and water consumption, environmental emissions at the manufacturing plant, and packaging and waste management (generation and transport).
Source of secondary data	In priority, background data was taken from the ecoinvent 3.9.1 "cut-off" datasets, which are representative of the United States or North America. When appropriate, the grid mix was changed to match the grid mix of the province or country where production takes place. Otherwise, ecoinvent data representative of the global market or the "rest of the world" was selected as a proxy. Steel data were taken from the AISC EPD and the US LCI Database. Wood and transport data were taken from the US LCI Database, which is specific to the North American context.
Geographical representativeness	The manufacturing facility is based in East Hartford, Connecticut, USA. Hence, electricity consumption is based on the Connecticut grid mix, and natural gas consumption is from a supplier in the same area. The geographical correlation of the material supply and the selected datasets largely represents the same area. When this was not possible, datasets representing larger geographical areas were used.
Temporal representativeness	Primary data was collected to be representative of the entire year of 2023. The selected datasets were not always published within the last ten years, though this is not the case for all ecoinvent and US LCI datasets. Nevertheless, ecoinvent and US LCI remain the reference LCI databases used in this study.
Technological representativeness	The primary data obtained from the manufacturer is representative of the company's current technologies and materials.
Completeness	All relevant process steps were considered and modeled to meet the goals and scope of the project. No known flows were intentionally cut off.

4. LIFE CYCLE ASSESSMENT RESULTS

4.1. RESULTS TABLES

The results of a life cycle impact assessment (LCIA) are relative expressions that do not predict impacts on category endpoints, exceeding of thresholds, safety margins, or risks. The six impact categories reported are considered sufficiently mature to be included in Type III environmental declarations. Other categories are being developed, and LCA should continue to advance in this area. However, EPD users should not use additional measures for comparison purposes.

The tables below present the LCIA results for one (1) metric ton of DU of Fire-Trol® fireproof columns as minimum pre-set indicators for reporting impact categories. This set includes TRACI methodology indicators, as well as indicators for primary energy consumption, consumption of renewable and non-renewable materials, water consumption, and waste generation.

TRACI 2.1 Potential impact indicators
GWP: Global Warming Potential; **AP**: Acidification Potential : **EP**: Eutrophication Potential : **ODP**: Ozone Layer Depletion Potential; **SFP**: Smog Formation Potential; **ADP_{fossil}**: Abiotic Resource Depletion Potential of Non-Renewable (Fossil) Energy Resources.
Resource Use
RPR_E: Renewable Primary Resources Used as Energy Carrier (Fuel); **RPR_M**: Renewable Primary Resources with Energy Content Used as Material; **RPR_T**: Renewable Primary Resources Total; **$NRPR_E$**: Non-Renewable Primary Resources Used as Energy Carrier (Fuel); **$NRPR_M$**: Non-Renewable Primary Resources with Energy Content Used as Material; **$NRPR_T$**: Non-Renewable Primary Resources Total; **SM**: Secondary Materials; **RSF**: Renewable Secondary Fuels; **NRSF**: Non-Renewable Secondary Fuels; **RE**: Recovery Energy; **FW**: Use of Net Fresh Water Resources.
Output flows and waste categories
HWD: Hazardous Waste Disposed; **NHWD**: Non-Hazardous Waste Disposed; **RWD**: Radioactive Waste Disposed; **HLRW**: High-Level Radioactive Waste conditioned to final repository; **ILLRW**: Intermediate and Low-Level Radioactive Waste conditioned to final repository; **CRU**: Components for Re-Use; **MFR**: Materials for Recycling; **MER**: Materials for Energy Recovery; **EE**: Exported Energy.

Environmental Indicator	Unit	Results for 1 metric ton of Fire-Trol® fireproof column OH			
		A1	A2	A3	A1 - A3
TRACI 2.1					
GWP_{100}-AR5[1]	kg CO_2 eq.	9.16E+02	1.17E+01	1.57E+02	1.09E+03
GWP_{100}-AR4[2]	kg CO_2 eq.	9.14E+02	1.17E+01	1.54E+02	1.08E+03
AP	kg SO_2 eq.	2.91E+00	1.36E-01	5.93E-01	3.64E+00
EP	kg N eq.	4.88E-01	9.81E-03	1.05E+00	1.55E+00
ODP	kg CFC-11 eq.	1.01E-05	4.03E-08	6.19E-06	1.63E-05
SFP	kg O_3 eq.	4.48E+01	3.71E+00	1.22E+01	6.06E+01
ADP_{fossil}[3]	MJ, LHV	1.42E+03	1.59E+02	8.66E+02	2.44E+03
Resource Use					
RPR_E[4]	MJ, LHV	4.87E+02	3.07E-01	3.79E+03	4.28E+03
RPR_M[5]	MJ, LHV	9.64E+01	0.00E+00	4.73E+03	4.83E+03
RPR_T	MJ, LHV	5.84E+02	3.07E-01	8.52E+03	9.11E+03
$NRPR_E$[6]	MJ, LHV	9.19E+03	1.58E+02	1.72E+03	1.11E+04
$NRPR_M$[7]	MJ, LHV	3.53E+02	0.00E+00	0.00E+00	3.53E+02
$NRPR_T$	MJ, LHV	9.55E+03	1.58E+02	1.72E+03	1.14E+04
SM	kg	5.11E+02	-	-	5.11E+02
RSF	MJ, LHV	-	-	-	-
NRSF	MJ, LHV	-	-	-	-
RE	MJ, LHV	-	-	-	-
FW[8]	m^3	4.84E+00	1.95E-03	1.76E+00	6.60E+00
Output flows and waste categories					
HWD[9]	kg	1.22E+01	1.03E-01	1.22E+02	1.35E+02
NHWD[10]	kg	5.00E+01	1.53E-01	1.69E+01	6.70E+01
HLRW[11]	m3	1.57E-06	1.18E-11	9.67E-07	2.54E-06
ILLRW[12]	m3	1.35E-03	7.02E-11	3.58E-06	1.35E-03
CRU	kg	-	-	-	-
MFR	kg	5.54E+01	-	5.81E+01	1.14E+02
MER	kg	-	-	-	-
EE	MJ, LHV	-	-	-	-

Environmental Indicator	Unit	Results for 1 metric ton of Fire-Trol® fireproof column OO			
		A1	A2	A3	A1 - A3
TRACI 2.1					
GWP_{100}-AR5[(1)]	kg CO_2 eq.	1.08E+03	1.97E+01	1.57E+02	1.25E+03
GWP_{100}-AR4[(2)]	kg CO_2 eq.	1.08E+03	1.96E+01	1.53E+02	1.25E+03
AP	kg SO_2 eq.	2.73E+00	2.33E-01	5.92E-01	3.56E+00
EP	kg N eq.	3.02E-01	1.68E-02	1.05E+00	1.37E+00
ODP	kg CFC-11 eq.	1.77E-06	6.75E-08	6.40E-06	8.23E-06
SFP	kg O_3 eq.	4.52E+01	6.37E+00	1.22E+01	6.37E+01
ADP_{fossil}[(3)]	MJ, LHV	1.01E+03	2.66E+02	8.72E+02	2.14E+03
Resource Use					
RPR_E[(4)]	MJ, LHV	6.16E+02	5.14E-01	3.79E+03	4.41E+03
RPR_M[(5)]	MJ, LHV	9.64E+01	0.00E+00	4.73E+03	4.83E+03
RPR_T	MJ, LHV	7.13E+02	5.14E-01	8.52E+03	9.23E+03
$NRPR_E$[(6)]	MJ, LHV	1.27E+04	2.65E+02	1.72E+03	1.47E+04
$NRPR_M$[(7)]	MJ, LHV	3.54E+02	0.00E+00	0.00E+00	3.54E+02
$NRPR_T$	MJ, LHV	1.31E+04	2.65E+02	1.72E+03	1.51E+04
SM	kg	4.58E+02	-	-	4.58E+02
RSF	MJ, LHV	-	-	-	-
NRSF	MJ, LHV	-	-	-	-
RE	MJ, LHV	-	-	-	-
FW[(8)]	m^3	6.03E+00	3.28E-03	1.62E+00	7.66E+00
Output flows and waste categories					
HWD[(9)]	kg	5.65E+00	1.72E-01	8.81E+01	9.39E+01
NHWD[(10)]	kg	8.19E+00	2.57E-01	1.39E+01	2.23E+01
HLRW[(11)]	m3	1.13E-06	1.98E-11	6.79E-08	1.20E-06
ILLRW[(12)]	m3	1.70E-03	1.18E-10	5.05E-07	1.70E-03
CRU	kg	-	-	-	-
MFR	kg	7.11E+01	-	5.81E-02	7.12E+01
MER	kg	-	-	-	-
EE	MJ, LHV	-	-	-	-

Environmental Indicator	Unit	Results for 1 metric ton of Fire-Trol® fireproof column OS			
		A1	A2	A3	A1 - A3
TRACI 2.1					
GWP_{100}-AR5[1]	kg CO_2 eq.	1.14E+03	7.18E+00	1.57E+02	1.31E+03
GWP_{100}-AR4[2]	kg CO_2 eq.	1.14E+03	7.14E+00	1.54E+02	1.30E+03
AP	kg SO_2 eq.	2.86E+00	8.00E-02	5.93E-01	3.53E+00
EP	kg N eq.	3.06E-01	5.81E-03	1.05E+00	1.36E+00
ODP	kg CFC-11 eq.	1.73E-06	2.47E-08	6.19E-06	7.94E-06
SFP	kg O_3 eq.	4.75E+01	2.18E+00	1.22E+01	6.19E+01
ADP_{fossil}[3]	MJ, LHV	9.85E+02	9.72E+01	8.66E+02	1.95E+03
Resource Use					
RPR_E[4]	MJ, LHV	6.58E+02	1.88E-01	3.79E+03	4.45E+03
RPR_M[5]	MJ, LHV	9.64E+01	0.00E+00	4.73E+03	4.83E+03
RPR_T	MJ, LHV	7.54E+02	1.88E-01	8.52E+03	9.28E+03
$NRPR_E$[6]	MJ, LHV	1.36E+04	9.67E+01	1.72E+03	1.54E+04
$NRPR_M$[7]	MJ, LHV	3.55E+02	0.00E+00	0.00E+00	3.55E+02
$NRPR_T$	MJ, LHV	1.39E+04	9.67E+01	1.72E+03	1.57E+04
SM	kg	7.63E+01	-	-	7.63E+01
RSF	MJ, LHV	-	-	-	-
NRSF	MJ, LHV	-	-	-	-
RE	MJ, LHV	-	-	-	-
FW[8]	m^3	6.37E+00	1.20E-03	1.58E+00	7.96E+00
Output flows and waste categories					
HWD[9]	kg	5.54E+00	6.30E-02	1.22E+02	1.28E+02
NHWD[10]	kg	8.72E+00	9.38E-02	1.69E+01	2.57E+01
HLRW[11]	m3	1.21E-06	7.25E-12	9.67E-07	2.18E-06
ILLRW[12]	m3	1.83E-03	4.30E-11	3.58E-06	1.83E-03
CRU	kg	-	-	-	-
MFR	kg	7.63E+01	-	5.81E-02	7.64E+01
MER	kg	-	-	-	-
EE	MJ, LHV	-	-	-	-

Environmental Indicator	Unit	Results for 1 metric ton of Fire-Trol® fireproof column SH			
		A1	A2	A3	A1 - A3
TRACI 2.1					
GWP_{100}-AR5[1]	kg CO_2 eq.	1.05E+03	5.09E+00	1.57E+02	1.21E+03
GWP_{100}-AR4[2]	kg CO_2 eq.	1.05E+03	5.07E+00	1.54E+02	1.21E+03
AP	kg SO_2 eq.	3.07E+00	5.45E-02	5.93E-01	3.72E+00
EP	kg N eq.	4.87E-01	3.98E-03	1.05E+00	1.54E+00
ODP	kg CFC-11 eq.	1.01E-05	1.75E-08	6.19E-06	1.63E-05
SFP	kg O_3 eq.	4.83E+01	1.48E+00	1.22E+01	6.20E+01
ADP_{fossil}[3]	MJ, LHV	1.24E+03	6.90E+01	8.66E+02	2.17E+03
Resource Use					
RPR_E[4]	MJ, LHV	5.86E+02	1.33E-01	3.79E+03	4.38E+03
RPR_M[5]	MJ, LHV	9.64E+01	0.00E+00	4.73E+03	4.83E+03
RPR_T	MJ, LHV	6.82E+02	1.33E-01	8.52E+03	9.20E+03
$NRPR_E$[6]	MJ, LHV	1.12E+04	6.87E+01	1.72E+03	1.30E+04
$NRPR_M$[7]	MJ, LHV	3.54E+02	0.00E+00	0.00E+00	3.54E+02
$NRPR_T$	MJ, LHV	1.15E+04	6.87E+01	1.72E+03	1.33E+04
SM	kg	6.86E+01	-	-	6.86E+01
RSF	MJ, LHV	-	-	-	-
NRSF	MJ, LHV	-	-	-	-
RE	MJ, LHV	-	-	-	-
FW[8]	m^3	5.78E+00	8.50E-04	1.70E+00	7.49E+00
Output flows and waste categories					
HWD[9]	kg	1.00E+01	4.47E-02	1.22E+02	1.33E+02
NHWD[10]	kg	5.31E+01	6.66E-02	1.69E+01	7.01E+01
HLRW[11]	m3	1.81E-06	5.15E-12	9.67E-07	2.78E-06
ILLRW[12]	m3	1.67E-03	3.05E-11	3.58E-06	1.67E-03
CRU	kg	-	-	-	-
MFR	kg	6.86E+01		5.81E-02	6.87E+01
MER	kg	-	-	-	-
EE	MJ, LHV	-	-	-	-

Environmental Indicator	Unit	Results for 1 metric ton of Fire-Trol® fireproof column SS			
		A1	A2	A3	A1 - A3
TRACI 2.1					
GWP_{100}-AR5[1]	kg CO_2 eq.	1.16E+03	5.09E+00	1.57E+02	1.33E+03
GWP_{100}-AR4[2]	kg CO_2 eq.	1.16E+03	5.07E+00	1.54E+02	1.32E+03
AP	kg SO_2 eq.	2.78E+00	5.45E-02	5.93E-01	3.43E+00
EP	kg N eq.	2.92E-01	3.98E-03	1.05E+00	1.35E+00
ODP	kg CFC-11 eq.	1.50E-06	1.75E-08	6.19E-06	7.70E-06
SFP	kg O_3 eq.	4.69E+01	1.48E+00	1.22E+01	6.06E+01
ADP_{fossil}[3]	MJ, LHV	8.46E+02	6.90E+01	8.65E+02	1.78E+03
Resource Use					
RPR_E[4]	MJ, LHV	6.81E+02	1.33E-01	3.79E+03	4.47E+03
RPR_M[5]	MJ, LHV	9.64E+01	0.00E+00	4.73E+03	4.83E+03
RPR_T	MJ, LHV	7.78E+02	1.33E-01	8.52E+03	9.30E+03
$NRPR_E$[6]	MJ, LHV	1.40E+04	6.87E+01	1.72E+03	1.58E+04
$NRPR_M$[7]	MJ, LHV	3.55E+02	0.00E+00	0.00E+00	3.55E+02
$NRPR_T$	MJ, LHV	1.44E+04	6.87E+01	1.72E+03	1.62E+04
SM	kg	5.15E+02	-	-	5.15E+02
RSF	MJ, LHV	-	-	-	-
NRSF	MJ, LHV	-	-	-	-
RE	MJ, LHV	-	-	-	-
FW[8]	m^3	6.70E+00	8.50E-04	1.53E+00	8.23E+00
Output flows and waste categories					
HWD[9]	kg	3.59E+00	4.47E-02	1.22E+02	1.26E+02
NHWD[10]	kg	8.84E+00	6.66E-02	1.69E+01	2.58E+01
HLRW[11]	m3	1.27E-06	5.15E-12	9.67E-07	2.24E-06
ILLRW[12]	m3	1.91E-03	3.05E-11	3.58E-06	1.91E-03
CRU	kg	-	-	-	-
MFR	kg	8.00E+01	-	5.81E-02	8.01E+01
MER	kg	-	-	-	-
EE	MJ, LHV	-	-	-	-

Table notes

(1) GWP 100. Excludes biogenic CO2 removals and emissions associated with biobased products and packaging; 100-year time horizon. GWP factors are provided by the IPCC 2013 Fifth Assessment Report (AR5).
(2): GWP 100. Excludes biogenic CO2 removals and emissions associated with biobased products and packaging; 100-year time horizon. GWP factors are provided by the IPCC 2007 Fourth Assessment Report (AR4).
(3) Calculated according to CML-baseline, v4.8, September 2016. [3]
(4): $RPR_E = RPR_T - RPR_M$, where RPR_T is equal to the value for renewable energy obtained using the CED methodology (LHV).
(5): Renewable primary resources with energy content used as a material. RPR_M. High value in A3 modules occurs mainly from energy content of the wood packaging materials declared per DU.
(6): $NRPR_E = NRPR_T - NRPR_M$, where $NRPR_T$ is equal to the value for non-renewable energy obtained using the CED methodology (LHV).
(7): Calculated as per ACLCA ISO 21930 Guidance. [4] 6.4 Non-renewable primary resources with energy content used as a material. $NRPR_M$.
(8): Represents the use of net fresh water calculated from life cycle inventory results. i.e., water consumption.
(9): Calculated from life cycle inventory results. based on datasets classified under " treatment and disposal of hazardous waste." The manufacturer does not generate hazardous waste.
(10): Calculated from life cycle inventory results. Based on waste that is neither "hazardous" nor "radioactive" and EPD values.
(11): Calculated from life cycle inventory results. Based on ecoinvent waste flow "high-level radioactive waste for final repository." The manufacturer does not generate radioactive waste.
(12): Calculated from life cycle inventory results. Based on ecoinvent waste flow "low-level radioactive waste for final repository." The manufacturer does not generate radioactive waste.

Limitation: "*Significant data limitations currently exist within the LCI data used to generate waste metrics for Life Cycle Assessments and Environmental Product Declarations. The waste metrics were calculated in a way conformant with the requirements of ISO 21930:2017, but these values represent rough estimates and are for informational purposes only. As such, no decisions regarding actual cradle-gate waste performance between products should be derived from these reported values*."

Comparability: "*Comparisons cannot be made between product-specific or industry average EPDs at the design stage of a project, before a building has been specified. Comparisons may be made between product-specific or industry average EPDs at the time of product purchase when product performance and specifications have been established and serve as a functional unit for comparison. Environmental impact results shall be converted to a functional unit basis before any comparison is attempted.*

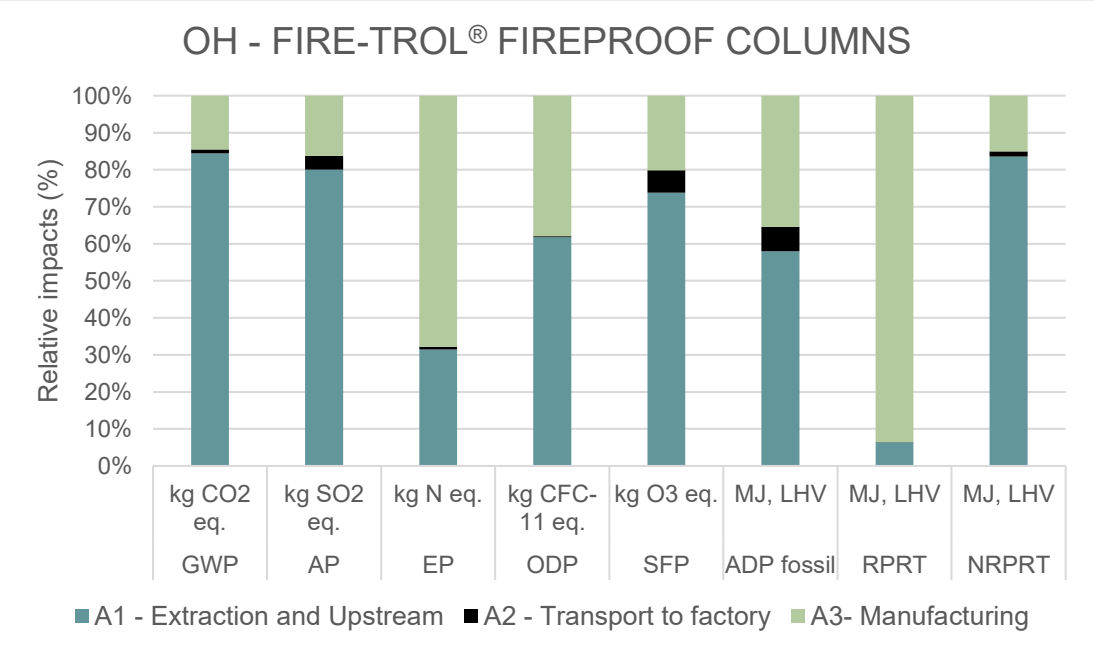
Any comparison of EPDs shall be subject to the requirements of ISO 21930. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries, are based on different product category rules or are missing relevant environmental impacts. Such comparison can be inaccurate, and could lead to erroneous selection of materials or products which are higher-impact, at least in some impact categories."

4.2. CONTRIBUTION ANALYSIS

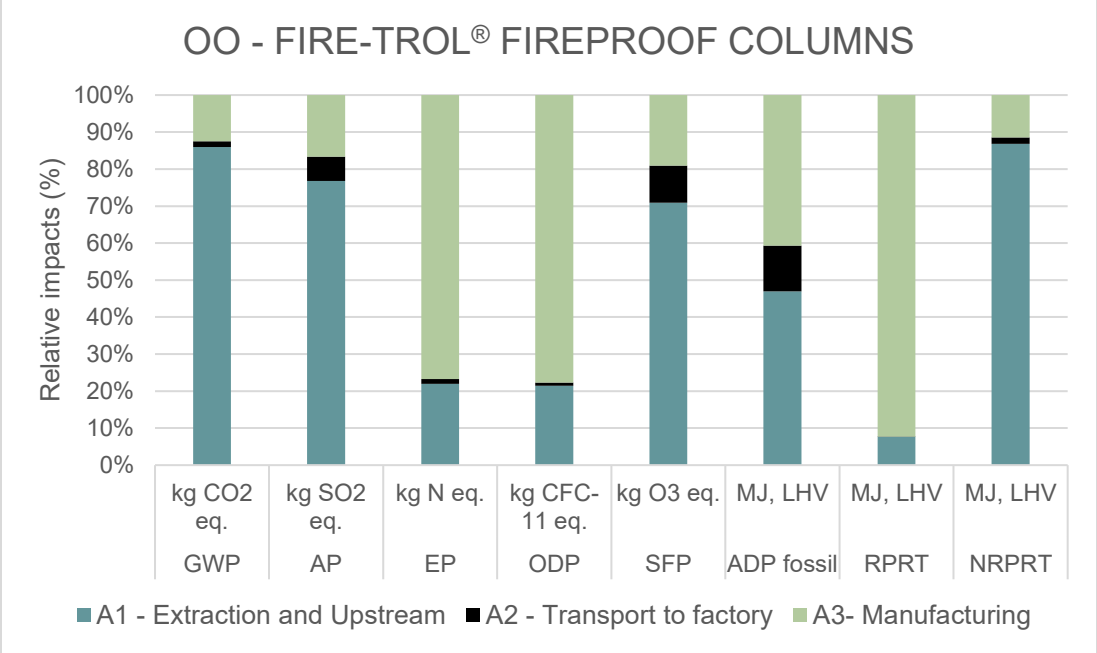
This section details the contribution of the different life cycle stage modules of each Fire-Trol® fireproof column to potential environmental impacts and resource use.

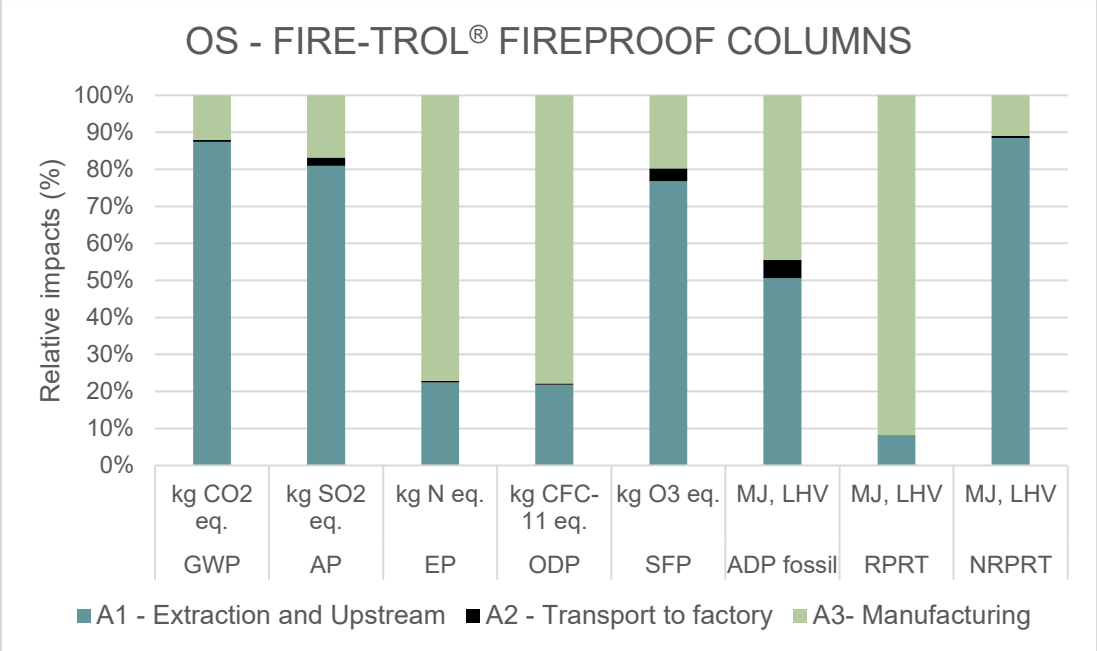
As the figures below show, the analysis revealed that the extraction and upstream processing of raw materials (module A1) has the highest environmental impact for the majority of LCIA indicators. For some fireproof column models, the manufacturing stage (module A3) has the highest environmental impact for other indicators, such as EP and ODP, due to the contribution of packaging materials (chemical packaging and oak dunnage) and waste sent to landfills. For all fireproof column models, transport to the factory (module A2) strongly contributes to acidification potential (AP), smog formation potential (SFP) and abiotic resource depletion of non-renewable (fossil) energy resources (ADP_{fossil}).

In terms of total consumption of renewable and non-renewable resources, modules A3 and A1, respectively, are the life cycle stages with the highest environmental impact.

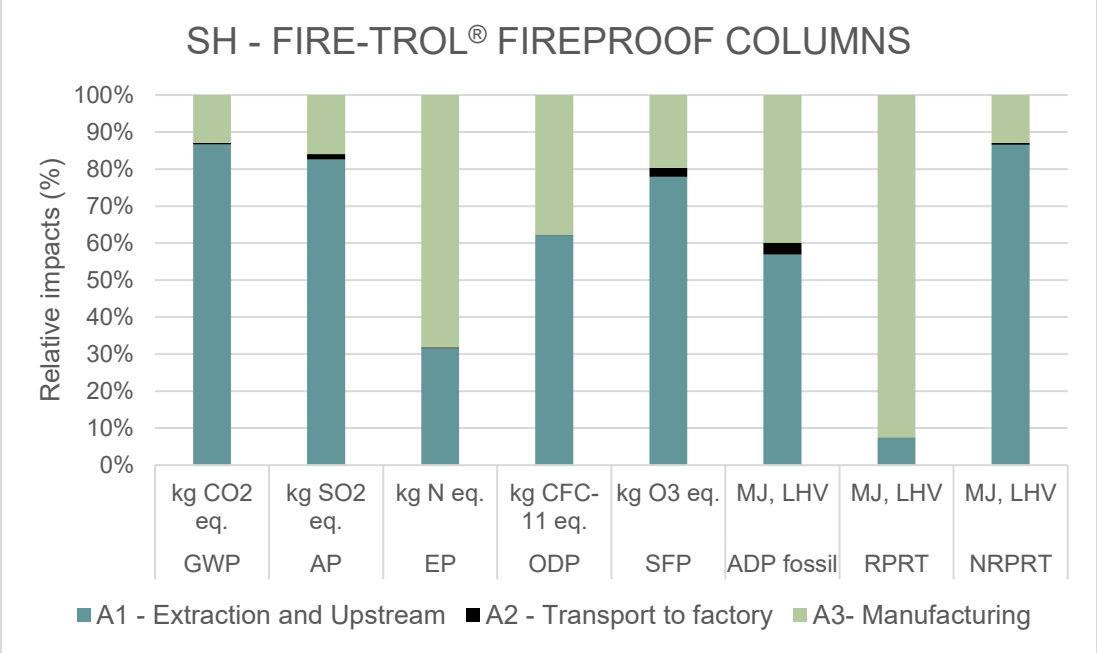


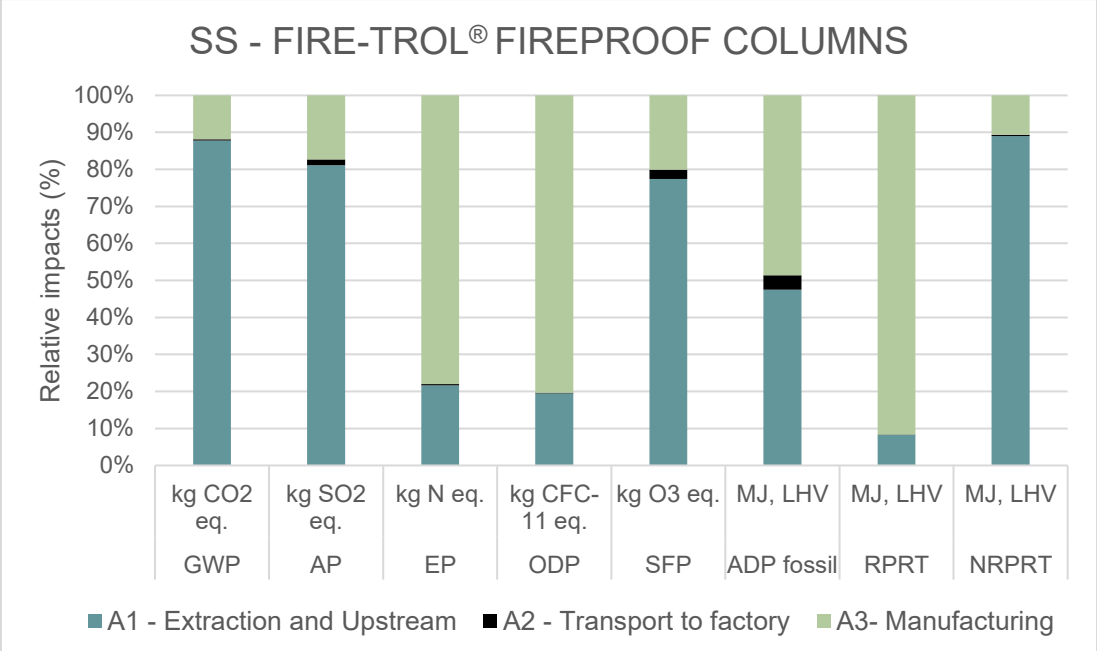
GWP: Global Warming Potential; **AP**: Acidification Potential; **EP**: Eutrophication Potential; **ODP**: Ozone Layer Depletion Potential; **SFP**: Smog Formation Potential; **ADP_{fossil}**: Abiotic Resource Depletion Potential of Non-Renewable (Fossil) Energy Resources; **RPR_T**: Renewable Primary Resources Total; **$NRPR_T$**: Non-Renewable Primary Resources Total.





GWP: Global Warming Potential; **AP**: Acidification Potential; **EP**: Eutrophication Potential; **ODP**: Ozone Layer Depletion Potential; **SFP**: Smog Formation Potential; **ADP_{fossil}**: Abiotic Resource Depletion Potential of Non-Renewable (Fossil) Energy Resources; **RPR_T**: Renewable Primary Resources Total; **$NRPR_T$**: Non-Renewable Primary Resources Total.





GWP: Global Warming Potential; **AP**: Acidification Potential; **EP**: Eutrophication Potential; **ODP**: Ozone Layer Depletion Potential; **SFP**: Smog Formation Potential; **ADP_{fossil}**: Abiotic Resource Depletion Potential of Non-Renewable (Fossil) Energy Resources; **RPR_T**: Renewable Primary Resources Total; **$NRPR_T$**: Non-Renewable Primary Resources Total.

5. ADDITIONAL ENVIRONMENTAL INFORMATION

5.1. BIOGENIC CARBON

The product does not contain biogenic carbon. However, there is biogenic carbon in the packaging. The amount of biogenic carbon in the packaging materials has been calculated based on the cardboard and oak dunnage used. The biogenic carbon removal (indicated by the minus sign) from this packaging material at Module A3 represents - 4.56E+01 kg CO_2 eq. per one (1) metric ton of Fire-Trol® fireproof columns. Oak wood packaging materials enter the product system in Module A3 and are usually sent to landfill in Module A5. This means that the biogenic carbon content in these materials stays stored until Module A5 where the emissions could occur. The emissions from these wood materials depend on their end-of-life scenarios.

5.2. ENVIRONMENT AND HEALTH DURING MANUFACTURING

Fire-Trol® is fully committed to diligently protecting the environment, as well as the health and safety of its own workers and those of its customers. The company's manufacturing process includes state-of-the-art environmental control equipment, and its workers are equipped with the highest quality personal protective gear. The Fire-Trol® research and development process strives to create sustainable architectural products for buildings and their occupants. Risk management includes priming rules in accordance with the fabricator's standard lead- and chromate-free, non-asphalt, rust-inhibiting primer in accordance with sections 09 91 13 (exterior painting), 09 91 23 (interior painting), and 09 97 13 (steel coatings).

5.3. ENVIRONMENT AND HEALTH DURING INSTALLATION

Based on the manufacturer's declaration, Fire-Trol® fireproof columns are not considered products with hazardous contents.

Products should be processed and installed according to the manufacturer’s written instructions, industry standards, and applicable building codes. Only erectors with training and verifiable similar work experience are required during the erection of the columns, and substrate conditions must be verified by an architect or engineer beforehand. Installation must comply with AISC 325 and 303 standards, as specified.

5.4. FURTHER INFORMATION

In addition, Fire-Trol® is engaged in a third-party verification process with Vertima Inc., in which the environmental documents of its fireproof columns (OH, OO, OS, SH, and SS) are assessed. Upon completion of the process, Fire-Trol® will receive a Validated Eco-Declaration® (EDS—Environmental Data Sheet), which summarizes verified environmental claims.

Fire-Trol® has also published Health Product Declarations® (HPDs) for its fireproof columns under study in this Environmental Product Declaration and the Life Cycle Assessment (LCA) report. Vertima Inc. prepared the HPDs as part of the third-party preparation process. More details are available in the HPDC public repository: https://www.hpd-collaborative.org/hpd-public-repository/ .

6. REFERENCES

[1] International Organization for Standardization (ISO), "ISO 14025 Environmental labels and declarations — Type III environmental declarations — Principles and procedures," 2006.

[2] UL Environment, "PCR Guidance for Building-Related Products and Services Part B: Designated Steel Construction Product EPD Requirements," 2020.

[3] University of Leiden, "CML-IA Characterisation Factors," 2016. [Online]. Available: https://www.universiteitleiden.nl/en/research/research-output/science/cml-ia-characterisation-factors. [Accessed 2025].

[4] ACLCA, *Guidance to Calculating Non-LCIA Inventory Metrics in Accordance with ISO 21930:2017,* American Center for Life Cycle Assessment (ACLCA), 2019-05.

[5] International Organization for Standardization (ISO), "ISO 21930 : 2017 (E) Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services," 2017.

[6] I. O. f. S. (ISO), "ISO 14044:2006/AMD1:2017/AMD 2:2020 Environmental management - Life cycle assessment - Requirements and guidelines," 2006.

[7] Vertima, "Life Cycle Assessment of Fireproof Columns models: OH, OO, OS, SH and SS Manufactured by Fire-Trol®," 2025.

[8] UL Environment, "PCR Guidance for Building-Related Products and Services Part A: Life Cycle Assessment Calculation Rules and Report Requirements," 2022.

[9] I. O. f. S. (ISO), "ISO 14040:2006/AMD 1:2020 Environmental management - Life cycle assessment - Principles and framework," 2020.

[10] ASTM, "ASTM Program Operator Rules. Version: 8.0, Revised 04/29/20," 2020. [Online]. Available: www.astm.org.

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EPD

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