

# INTERSTATE® BRICK

More Sizes, More Shapes, More Possibilities



## Environmental Product Declaration

This document is a product-specific Type III Environmental Product Declaration (EPD) for 4 types of clay bricks and clay brick pavers produced in 76 different colors at Interstate Brick, 9780 South 5200, West Jordan, UT.

Interstate Brick  
9780 South 5200, West Jordan, UT 84081  
(800) 233-8654 • <http://www.interstatebrick.com>

# Environmental Product Declaration

## General Information

This study has been performed according to the requirements of the ASTM International Product Category Rule (PCR) for Clay Bricks, Clay Brick Pavers, and Structural Clay Tile (ASTM, 2016). This study was conducted in accordance with ISO 14025 (ISO 14025, 2006), ISO 14040 (ISO 14040, 2006), ISO 14044 (ISO 14044, 2006), and ISO 21930 (ISO 21930, 2007).

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Independent verification of the declaration and data, according to ISO 14025:  internal  external

### Program Operator:

ASTM International

<http://www.astm.org/EPDs.htm>



### EPD Owner:

Interstate Brick

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**Declared Unit:** 1 cubic meter (m<sup>3</sup>)

### Date of Issue:

March 12 2020 (valid for 5 years until March 12, 2025)


**ASTM Declaration Number:** EPD-131

# Environmental Product Declaration


## Product Information

Four brick types (Tables 1-4) were evaluated in this study: face bricks, structural bricks, thin bricks and pavers. Tables 1-4 define each of the brick types. Face and thin bricks are subdivided into 2 groups reflecting the two different kilns used for manufacturing.<sup>1</sup> Structural bricks are subdivided into 5 groups reflecting the different percent voids of the bricks (the higher the percent void the lighter the brick per m<sup>3</sup>).<sup>2</sup> Pavers were subdivided into two types, regular pavers and pool coping pavers. Both paver types were further subdivided into two groups reflecting the two different kilns used for manufacturing.

**Table 1: Face brick product description**

Product Type: Clay Face Bricks					
		<b>Standards</b> ASTM C216, ASTM C62		<b>Description</b> Specification for Clay Facing Brick	
Group	Description	Density(pcf)	Percent Void(%)	Weight / m <sup>3</sup> (lb)	Kiln Number
1	Face Brick Kiln 3	120	37	3178.3	3
2	Face Brick Kiln 4	120	37	3178.3	4
<b>Material Composition:</b> clay / shale aluminum silicates (90-95%), manganese dioxide (<3%), chromite (<3%), barium carbonite (<1%)					

**Table 2: Structural brick product description**

Product Type: Structural Bricks - Atlast™					
		<b>Standards</b> ASTM C652		<b>Description</b> Specification for Clay Hollow Reinforceable Structural Brick used in walls, columns, beams and piers. Brick are intended to be reinforced and grouted. Commonly used to resist loads due to gravity, wind, earthquake, blast, ballistic and fire.	
Group	Description	Density(pcf)	Percent Void(%)	Weight / m <sup>3</sup> (lb)	Kiln Number
1	Structural Brick 35% Void	120	35	2754.5	4
2	Structural Brick 37% Void	120	37	2669.8	4
3	Structural Brick 43% Void	120	43	2415.5	4
4	Structural Brick 48% Void	120	48	2203.6	4
5	Structural Brick 52% Void	120	52	2034.1	4
<b>Material Composition:</b> clay / shale aluminum silicates (90-95%), manganese dioxide (<3%), chromite (<3%), barium carbonite (<1%)					


<sup>1</sup> Each kiln has a different energy efficiency.

<sup>2</sup> Heavier bricks have higher impacts per m<sup>3</sup>, the declared unit.



# Environmental Product Declaration

## Product Information

**Table 3: Thin brick product description**

Product Type: Thin Brick					
		<b>Standards</b> ASTM C1088		<b>Description</b> Specification for Thin Facing Brick. Typically used in Precast and adhered applications.	
Group	Description	Density(pcf)	Percent Void(%)	Weight / m³(lb)	Kiln Number
1	Thin Brick Kiln 3	120	0	4237.8	3
2	Thin Brick Kiln 4	120	0	4237.8	4
<b>Material Composition:</b> clay / shale aluminum silicates (90-95%), manganese dioxide (<3%), chromite (<3%), barium carbonite (<1%)					

**Table 4: Pavers product description**

Product Type: Pavers					
		<b>Standards</b> ASTM C902 ASTM C1272		<b>Description</b> Specification for Light and Heavy Vehicular Clay Paving Brick on flexible and rigid base.	
Group	Description	Density(pcf)	Percent Void(%)	Weight / m³(lb)	Kiln Number
1	Paver Kiln 3	120	0	4237.8	3
2	Paver Kiln 4	120	0	4237.8	4
		<b>Standards</b> ASTM C902		<b>Description</b> Specification for Clay Pool Coping & Treading	
Group	Description	Density(pcf)	Percent Void(%)	Weight / m³(lb)	Kiln Number
1	Pool Coping Kiln 3	120	20	3390.2	3
2	Pool Coping Kiln 4	120	20	3390.2	4
<b>Material Composition:</b> clay / shale aluminum silicates (90-95%), manganese dioxide (<3%), chromite (<3%), barium carbonite (<1%)					

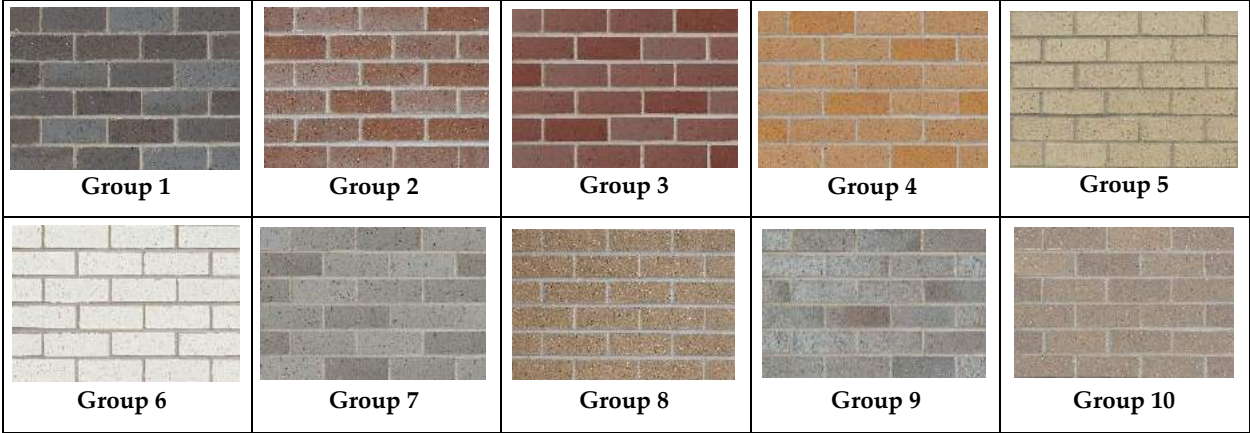
# Environmental Product Declaration

## Product Information

Every brick can be made into 76 different colors. Colors are grouped into 10 color groups (see Table 5) with similar environmental impacts<sup>3</sup>.

**Table 5: Colors evaluated in study**

Color Group	Brick Colors
Group 1	Cast Iron, Chippewa, Moroccan Brown, Ironstone, Mojave Brown, Walnut
Group 2	Briarwood, Bronzecreek, Bronzestone, Clifton, Dartmouth, Mahogany, Old Baltimore, Park Rose, Primrose
Group 3	Cape Cod, Carmel, Cherry Red, Cinnamon, Copperstone, Hampton, Monterey, Mountain Red, Old Canterbury, Old Mesa, Old Virginia, Red River, Santa Cruz, Terra Cotta
Group 4	Champagne, Chardonnay, Flint, Lone Tree, Marigold, Ochre Buff, Ponderosa, Sahara
Group 5	Bordeaux, Cactus, Canyon Mist, Canyon Rose, Charleston, Clarkston, Country Manor, English Tudor, Golden Buff, Lewiston, Rose, Sage, Silver City, Stratford, Tumbleweed, Willow Creek
Group 6	Almond, Artic White, Ash, Cedar, Glacier Mist, Pewter, Sawgrass, Stone Gray, Uintah, Wheat
Group 7	Chrome, Columbard, Platinum
Group 8	Smokey Mist, Smokey Mountain
Group 9	Black Ice, Black Opal, Coal, Ebony, Midnight Black, Obsidian
Group 10	Coffee, Mocha



**Figure 1: Base color for each color group.**

Base colors shown do not represent all the colors within a group, rather they show the general color of the group. See Interstate Brick’s website for images of the individual names listed in Table 5.

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<sup>3</sup> The range between the highest and lowest impact value is <10% for all but one environmental impact indicator, nonrenewable, nuclear (NR-N).

# Environmental Product Declaration

## LCA Study

### System boundary

This study captures the following mandatory cradle-to-gate (A1-A3) life cycle product stages (as illustrated in Figure 2):

**A1 – Raw Material Supply** (upstream processes): Extraction and processing of raw materials, including fuels used in extraction and transport within the process and any crushing or grinding required for transport.

**A2 – Transportation:** Average or specific transportation of raw materials (including recycled or recovered materials) from extraction site or source to manufacturing site and including empty backhauls and transportation to intermediate distribution centers or terminals;

**A3 – Manufacturing** (core processes): Manufacturing of the product including:

- crushing, grinding and screening the clay;
- extruding, forming, cutting and glazing the bricks;
- drying, loading kiln cars, firing and cooling the bricks;
- packaging (including transportation of packaging from source of manufacturing) of the bricks to make ready for either rail or truck shipment;
- scrubber and wastewater treatment operations;
- transportation of pre-consumer wastes and unutilized by-products from manufacturing site to recycling/reuse/landfill, including empty backhauls; and
- recycling/recovering/reuse/energy recovery of pre-consumer wastes and by-products from production.

PRODUCTION STAGE (Mandatory)			CONSTRUCTION STAGE		USE STAGE					END - OF - LIFE STAGE			
Extraction and upstream production	Transport to factory	Manufacturing	Transport to Site	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	De-construction/ Demolition	Transport to waste processing or disposal	Waste processing	Disposal of waste
<b>A1</b>	<b>A2</b>	<b>A3</b>	<b>A4</b>	<b>A5</b>	<b>B1</b>	<b>B2</b>	<b>B3</b>	<b>B4</b>	<b>B5</b>	<b>C1</b>	<b>C2</b>	<b>C3</b>	<b>C4</b>

Figure 2. Life-Cycle Stages and Modules

# Environmental Product Declaration

## LCA Study

Except as noted above, all other life cycle stages as described in Figure 2 are excluded from the LCA study. The following processes are also excluded from the study:

- Production, manufacture, and construction of buildings’ capital goods and infrastructure;
- Production and manufacture of production equipment, vehicles, earthmoving equipment, and laboratory equipment;
- Personnel-related activities (travel, furniture, office supplies);
- Energy and water use related to company management and sales activities, which that may be located either within the factory site or at another location.

The main processes included in the system boundary are illustrated in Figure 3.

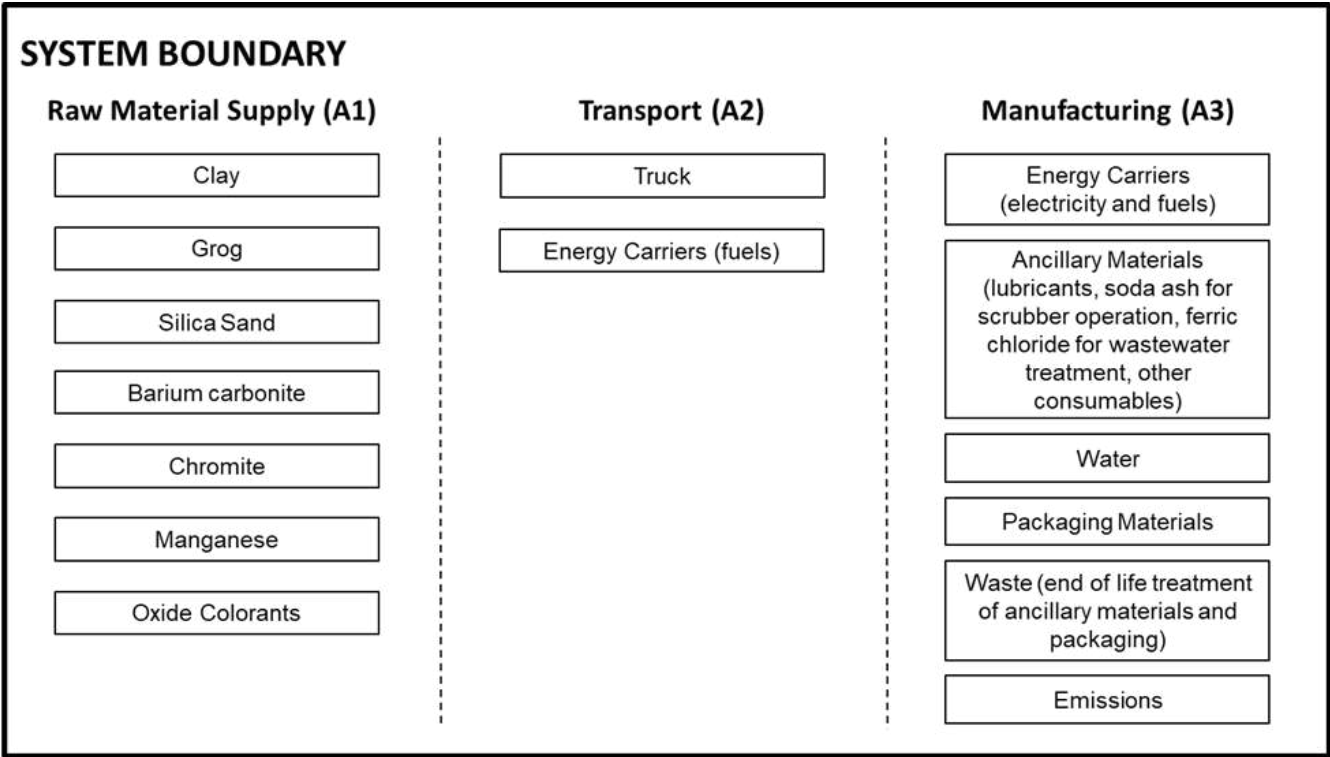


Figure 3 : Main processes included in system boundary

# Environmental Product Declaration

## LCA Study

### Life Cycle Inventory

Primary data was collected from Interstate Brick West Jordan, UT manufacturing location for the 2018 calendar year. Primary data was also collected from 9 mining locations managed by Interstate Brick.

Secondary life cycle inventory (LCI) data used to conduct this study are the best available. Where company or supplier-specific LCI data was not available, representative processes were selected from the US-EI database v2.2.3 (Long Trail Sustainability, 2016) or the ecoinvent 3.5 allocation, cut-off by classification databases (ecoinvent, 2018).

Electricity impacts are calculated based on the 2014 resource mix at the level of North American Electricity Reliability Council (WECC) region. Fuel mix for WECC: natural gas 28.8%, coal 28.1%, hydro 22.5%, wind 11.2%, nuclear 8%, geothermal 2%.

### Environmental Impacts

The life cycle environmental impact categories used in this study, outlined in the referenced PCR (ASTM, 2016), include:

**Table 6: Category indicators, reported units and abbreviation**

Category Indicator	Units	Abbreviation
Global warming potential	kg CO <sub>2</sub> eq	GWP
Acidification potential	kg SO <sub>2</sub> eq	AP
Eutrophication potential	kg N eq	EP
Smog creation potential	kg O <sub>3</sub> eq	SP
Ozone depletion potential	kg CFC-11 eq	OP
Non-renewable fossil	MJ (HHV)	NR-F
Non-renewable nuclear	MJ (HHV)	NR-N
Renewable (biomass)	MJ (HHV)	R-Bio
Renewable (solar, wind, hydroelectric and geothermal)	MJ (HHV)	R-Other
Non-renewable material resources	kg	R-M
Renewable material resources	kg	NR-M
Net fresh water (inputs minus outputs) <sup>4</sup>	m <sup>3</sup>	Water
Non-hazardous waste generated	kg	NH-W
Hazardous waste generated	kg	H-W

Cradle to Gate (A1-A3) impact results are outlined in Tables 7-19 for all brick types, groups and colors. Results are displayed per cubic meter (m<sup>3</sup>), the declared unit.

<sup>4</sup> Consumption of net fresh water includes fresh water entering the system being studied that is not returned to the same drainage basin that it originated from.



# Environmental Product Declaration

## LCA Study

This EPD only covers the cradle-to-gate impacts of bricks using a declared unit and the results cannot be used to compare between products. EPDs from different programs (using different PCR) may not be comparable.

Explanatory materials may be requested by contacting:

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### References

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ASTM. (2016). *Product Category Rules for Preparing an Environmental Product Declaration for Clay Brick, Clay Brick Pavers, and structural Clay Tile.*

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ISO 14044. (2006). *Environmental management - Life cycle assessment - Requirements and guidelines.*

ISO 21930. (2007). *ISO 21930; Sustainability in Building Construction - Environmental Declaration of Building Products.*

Long Trail Sustainability. (2016). *DATASMART (US-EI Database).* Huntington, VT: Long Trail Sustainability.

# Environmental Product Declaration

## Life Cycle Impact Assessment

### Results - Face Bricks

**Table 7: Face Brick Kiln 3 average\* impact results per m<sup>3</sup> for each color group**

Color Group	Environmental Impact Potential					Primary Energy Consumption				Material Resources Consumption			Wastes	
	GWP	AP	EP	SP	OP	NR-F	NR-N	R-Bio	R-Other	NR-M	R-M	Water	NH-W	H-W
	kg CO <sub>2</sub> eq	kg SO <sub>2</sub> eq	kg N eq	kg O <sub>3</sub> eq	kg CFC-11 eq	MJ	MJ	MJ	MJ	kg	kg	m <sup>3</sup>	kg	kg
1	500	1.13	0.74	19.2	6.78E-05	8,549	227	245	224	765	13.1	1.90	6.78	0.01
2	506	1.16	0.76	19.6	6.81E-05	8,611	228	246	227	705	13.2	2.03	6.77	0.01
3	512	1.27	0.75	23.0	6.78E-05	8,718	221	245	224	1,157	13.1	1.95	6.83	0.01
4	515	1.31	0.76	23.9	6.78E-05	8,770	225	245	225	1,014	13.1	1.94	6.82	0.01
5	519	1.35	0.77	25.2	6.80E-05	8,827	227	245	226	1,100	13.1	2.00	6.86	0.01
6	528	1.40	0.78	25.7	6.84E-05	8,915	239	247	230	983	13.2	2.17	6.83	0.01
7	536	1.53	0.78	29.1	6.83E-05	9,052	231	246	231	957	13.2	2.25	6.90	0.01
8	543	1.46	0.85	26.6	7.02E-05	9,059	340	253	255	1,092	13.6	2.53	6.82	0.01
9	562	1.49	0.95	25.4	7.27E-05	9,197	461	262	288	877	14.1	3.14	6.78	0.02
10	605	1.79	1.06	31.9	7.52E-05	9,690	568	270	319	1,082	14.6	3.88	6.81	0.02

\* The range between the highest and lowest impact value is <10% for all but one environmental impact indicator, nonrenewable, nuclear (NR-N) for color group 5 which is <14%.

**Table 8: Face Brick Kiln 4 average\* impact results per m<sup>3</sup> for each color group**

Color Group	Environmental Impact Potential					Primary Energy Consumption				Material Resources Consumption			Wastes	
	GWP	AP	EP	SP	OP	NR-F	NR-N	R-Bio	R-Other	NR-M	R-M	Water	NH-W	H-W
	kg CO <sub>2</sub> eq	kg SO <sub>2</sub> eq	kg N eq	kg O <sub>3</sub> eq	kg CFC-11 eq	MJ	MJ	MJ	MJ	kg	kg	m <sup>3</sup>	kg	kg
1	568	1.19	0.75	19.7	7.85E-05	9,789	230	245	225	765	13.1	1.91	6.78	0.01
2	574	1.22	0.76	20.1	7.87E-05	9,850	227	246	227	697	13.1	2.03	6.77	0.01
3	580	1.33	0.76	23.5	7.85E-05	9,958	224	245	224	1,157	13.1	1.96	6.83	0.01
4	584	1.37	0.77	24.4	7.85E-05	10,010	228	245	225	1,014	13.1	1.94	6.82	0.01
5	588	1.41	0.77	25.6	7.87E-05	10,067	231	245	226	1,100	13.1	2.01	6.86	0.01
6	596	1.46	0.79	26.2	7.91E-05	10,155	242	247	231	983	13.2	2.17	6.83	0.01
7	605	1.59	0.79	29.6	7.90E-05	10,292	234	246	232	957	13.2	2.25	6.90	0.01
8	612	1.52	0.86	27.0	8.09E-05	10,299	343	253	256	1,092	13.6	2.53	6.82	0.01
9	630	1.55	0.96	25.9	8.34E-05	10,437	465	262	289	877	14.1	3.15	6.78	0.02
10	674	1.85	1.07	32.3	8.59E-05	10,931	571	270	319	1,082	14.6	3.88	6.81	0.02

\* The range between the highest and lowest impact value is <10% for all but one environmental impact indicator, nonrenewable, nuclear (NR-N) for color group 5 which is <14%.

# Environmental Product Declaration

## Life Cycle Impact Assessment

### Results - Structural Bricks

**Table 9: Structural Brick 35% Void average\* impact results per m<sup>3</sup> for each color group**

Color Group	Environmental Impact Potential					Primary Energy Consumption				Material Resources Consumption			Wastes	
	GWP	AP	EP	SP	OP	NR-F	NR-N	R-Bio	R-Other	NR-M	R-M	Water	NH-W	H-W
	kg CO <sub>2</sub> eq	kg SO <sub>2</sub> eq	kg N eq	kg O <sub>3</sub> eq	kg CFC-11 eq	MJ	MJ	MJ	MJ	kg	kg	m <sup>3</sup>	kg	kg
1	493	1.03	0.65	17.0	6.80E-05	8,485	199	212	195	663	11.4	1.65	5.87	0.01
2	498	1.06	0.66	17.4	6.82E-05	8,538	197	213	196	604	11.4	1.76	5.86	0.01
3	503	1.15	0.66	20.3	6.80E-05	8,631	194	212	195	1,002	11.4	1.70	5.92	0.01
4	506	1.19	0.67	21.1	6.80E-05	8,676	197	212	195	879	11.4	1.68	5.91	0.01
5	510	1.22	0.67	22.2	6.82E-05	8,725	200	213	196	954	11.4	1.74	5.95	0.01
6	517	1.26	0.68	22.7	6.85E-05	8,802	210	214	200	852	11.5	1.88	5.92	0.01
7	524	1.38	0.68	25.6	6.85E-05	8,921	203	213	201	830	11.4	1.95	5.98	0.01
8	530	1.32	0.74	23.4	7.01E-05	8,927	298	219	222	947	11.8	2.19	5.91	0.01
9	546	1.34	0.83	22.5	7.23E-05	9,046	403	227	250	760	12.3	2.73	5.88	0.01
10	584	1.60	0.92	28.0	7.44E-05	9,474	495	234	277	938	12.7	3.36	5.90	0.02

\* The range between the highest and lowest impact value is <10% for all but one environmental impact indicator, nonrenewable, nuclear (NR-N) for color group 5 which is <14.

**Table 10: Structural Brick 37% Void average\* impact results per m<sup>3</sup> for each color group**

Color Group	Environmental Impact Potential					Primary Energy Consumption				Material Resources Consumption			Wastes	
	GWP	AP	EP	SP	OP	NR-F	NR-N	R-Bio	R-Other	NR-M	R-M	Water	NH-W	H-W
	kg CO <sub>2</sub> eq	kg SO <sub>2</sub> eq	kg N eq	kg O <sub>3</sub> eq	kg CFC-11 eq	MJ	MJ	MJ	MJ	kg	kg	m <sup>3</sup>	kg	kg
1	478	1.00	0.63	16.5	6.59E-05	8,223	193	206	189	643	11.0	1.60	5.69	0.01
2	482	1.03	0.64	16.9	6.62E-05	8,274	191	206	190	586	11.0	1.71	5.68	0.01
3	487	1.12	0.64	19.7	6.59E-05	8,365	188	206	189	972	11.0	1.64	5.74	0.01
4	490	1.15	0.65	20.5	6.59E-05	8,409	191	206	189	852	11.0	1.63	5.73	0.01
5	494	1.19	0.65	21.5	6.61E-05	8,456	194	206	190	924	11.0	1.69	5.76	0.01
6	501	1.23	0.66	22.0	6.64E-05	8,531	203	207	194	826	11.1	1.83	5.73	0.01
7	508	1.34	0.66	24.9	6.64E-05	8,646	196	207	195	804	11.1	1.89	5.79	0.01
8	514	1.28	0.72	22.7	6.79E-05	8,652	288	213	215	918	11.4	2.13	5.73	0.01
9	529	1.30	0.81	21.8	7.00E-05	8,767	390	220	243	737	11.9	2.64	5.70	0.01
10	566	1.56	0.90	27.2	7.21E-05	9,182	480	227	268	909	12.3	3.26	5.72	0.02

\* The range between the highest and lowest impact value is <10% for all but one environmental impact indicator, nonrenewable, nuclear (NR-N) for color group 5 which is <14.

# Environmental Product Declaration

## Life Cycle Impact Assessment

**Table 11: Structural Brick 43% Void average\* impacts for each of the 10-color group**

Color Group	Environmental Impact Potential					Primary Energy Consumption				Material Resources Consumption			Wastes	
	GWP	AP	EP	SP	OP	NR-F	NR-N	R-Bio	R-Other	NR-M	R-M	Water	NH-W	H-W
	kg CO2 eq	kg SO2 eq	kg N eq	kg O3 eq	kg CFC-11 eq	MJ	MJ	MJ	MJ	kg	kg	m3	kg	kg
1	432	0.91	0.57	14.9	5.96E-05	7,440	175	186	171	582	10.0	1.45	5.15	0.01
2	437	0.93	0.58	15.3	5.98E-05	7,487	175	187	173	536	10.0	1.54	5.14	0.01
3	441	1.01	0.58	17.8	5.96E-05	7,568	170	186	171	879	10.0	1.49	5.19	0.01
4	444	1.04	0.58	18.5	5.97E-05	7,607	173	186	171	771	10.0	1.48	5.19	0.01
5	447	1.07	0.59	19.5	5.98E-05	7,651	175	186	172	836	10.0	1.53	5.21	0.01
6	453	1.11	0.60	19.9	6.01E-05	7,718	184	187	176	747	10.0	1.65	5.19	0.01
7	460	1.21	0.60	22.5	6.00E-05	7,822	178	187	176	727	10.0	1.71	5.24	0.01
8	465	1.16	0.65	20.6	6.14E-05	7,827	261	192	194	830	10.3	1.92	5.19	0.01
9	479	1.18	0.73	19.7	6.34E-05	7,932	353	199	220	667	10.8	2.39	5.16	0.01
10	512	1.41	0.81	24.6	6.53E-05	8,307	434	205	243	823	11.1	2.95	5.18	0.01

\* The range between the highest and lowest impact value is <10% for all but one environmental impact indicator, nonrenewable, nuclear (NR-N) for color group 5 which is <14.

**Table 12: Structural Brick Group 48% Void average\* impacts for each of the 10-color group**

Color Group	Environmental Impact Potential					Primary Energy Consumption				Material Resources Consumption			Wastes	
	GWP	AP	EP	SP	OP	NR-F	NR-N	R-Bio	R-Other	NR-M	R-M	Water	NH-W	H-W
	kg CO2 eq	kg SO2 eq	kg N eq	kg O3 eq	kg CFC-11 eq	MJ	MJ	MJ	MJ	kg	kg	m3	kg	kg
1	394	0.83	0.52	13.6	5.44E-05	6,788	159	170	156	531	9.10	1.32	4.70	0.01
2	398	0.85	0.53	13.9	5.46E-05	6,830	158	170	157	484	9.11	1.41	4.69	0.01
3	402	0.92	0.53	16.3	5.44E-05	6,905	155	170	156	802	9.09	1.36	4.74	0.01
4	405	0.95	0.53	16.9	5.44E-05	6,941	158	170	156	703	9.10	1.35	4.73	0.01
5	408	0.98	0.54	17.8	5.45E-05	6,980	160	170	157	763	9.11	1.39	4.76	0.01
6	413	1.01	0.55	18.2	5.48E-05	7,042	168	171	160	682	9.16	1.51	4.73	0.01
7	420	1.10	0.55	20.5	5.48E-05	7,137	162	171	161	664	9.14	1.56	4.78	0.01
8	424	1.06	0.60	18.7	5.61E-05	7,141	238	176	177	757	9.44	1.76	4.73	0.01
9	437	1.07	0.67	18.0	5.78E-05	7,237	322	182	200	608	9.81	2.18	4.70	0.01
10	467	1.28	0.74	22.4	5.96E-05	7,579	396	187	221	750	10.2	2.69	4.72	0.01

\* The range between the highest and lowest impact value is <10% for all but one environmental impact indicator, nonrenewable, nuclear (NR-N) for color group 5 which is <14.

# Environmental Product Declaration

## Life Cycle Impact Assessment

**Table 13: Structural Brick 52% Void average\* impact results per m<sup>3</sup> for each color group**

Color Group	Environmental Impact Potential					Primary Energy Consumption				Material Resources Consumption			Wastes	
	GWP	AP	EP	SP	OP	NR-F	NR-N	R-Bio	R-Other	NR-M	R-M	Water	NH-W	H-W
	kg CO <sub>2</sub> eq	kg SO <sub>2</sub> eq	kg N eq	kg O <sub>3</sub> eq	kg CFC-11 eq	MJ	MJ	MJ	MJ	kg	kg	m <sup>3</sup>	kg	kg
1	364	0.76	0.48	12.6	5.02E-05	6,266	147	157	144	490	8.40	1.22	4.34	0.01
2	368	0.78	0.49	12.8	5.04E-05	6,305	146	157	145	446	8.41	1.30	4.33	0.01
3	371	0.85	0.49	15.0	5.02E-05	6,374	143	157	144	740	8.39	1.25	4.37	0.01
4	374	0.88	0.49	15.6	5.02E-05	6,407	146	157	144	649	8.40	1.24	4.37	0.01
5	376	0.90	0.50	16.4	5.03E-05	6,443	148	157	145	704	8.41	1.28	4.39	0.01
6	382	0.93	0.50	16.8	5.06E-05	6,500	155	158	148	629	8.46	1.39	4.37	0.01
7	387	1.02	0.51	18.9	5.06E-05	6,588	150	158	148	613	8.44	1.44	4.41	0.01
8	392	0.98	0.55	17.3	5.18E-05	6,592	220	162	164	699	8.71	1.62	4.37	0.01
9	403	0.99	0.62	16.6	5.34E-05	6,680	297	168	185	561	9.05	2.01	4.34	0.01
10	431	1.19	0.68	20.7	5.50E-05	6,996	366	173	204	693	9.37	2.48	4.36	0.01

\* The range between the highest and lowest impact value is <10% for all but one environmental impact indicator, nonrenewable, nuclear (NR-N) for color group 5 which is <14.

# Environmental Product Declaration

## Life Cycle Impact Assessment

### Results - Thin Bricks

**Table 14: Thin Brick Kiln 3 average\* impact results per m<sup>3</sup> for each color group**

Color Group	Environmental Impact Potential					Primary Energy Consumption				Material Resources Consumption			Wastes	
	GWP	AP	EP	SP	OP	NR-F	NR-N	R-Bio	R-Other	NR-M	R-M	Water	NH-W	H-W
	kg CO <sub>2</sub> eq	kg SO <sub>2</sub> eq	kg N eq	kg O <sub>3</sub> eq	kg CFC-11 eq	MJ	MJ	MJ	MJ	kg	kg	m <sup>3</sup>	kg	kg
1	667	1.51	0.99	25.6	9.04E-05	11,399	302	327	299	1,020	17.5	2.54	9.04	0.01
2	674	1.55	1.01	26.1	9.07E-05	11,480	299	327	301	930	17.5	2.70	9.02	0.02
3	682	1.69	1.00	30.6	9.04E-05	11,624	295	326	299	1,542	17.5	2.61	9.11	0.01
4	687	1.74	1.01	31.9	9.04E-05	11,693	299	327	300	1,353	17.5	2.58	9.10	0.01
5	693	1.80	1.02	33.6	9.06E-05	11,769	303	327	301	1,467	17.5	2.67	9.15	0.02
6	703	1.86	1.04	34.3	9.12E-05	11,887	319	329	307	1,311	17.6	2.89	9.10	0.02
7	715	2.04	1.04	38.8	9.11E-05	12,069	308	328	308	1,276	17.6	3.00	9.19	0.02
8	724	1.95	1.13	35.4	9.36E-05	12,079	454	338	340	1,456	18.2	3.37	9.10	0.02
9	749	1.98	1.27	33.9	9.70E-05	12,262	615	349	384	1,169	18.9	4.19	9.05	0.02
10	807	2.39	1.41	42.5	1.00E-04	12,920	758	360	425	1,443	19.5	5.17	9.08	0.02

\* The range between the highest and lowest impact value is <10% for all but one environmental impact indicator, nonrenewable, nuclear (NR-N) for color group 5 which is <14.

**Table 15: Thin Brick Kiln 4 average\* impact results per m<sup>3</sup> for each color group**

Color Group	Environmental Impact Potential					Primary Energy Consumption				Material Resources Consumption			Wastes	
	GWP	AP	EP	SP	OP	NR-F	NR-N	R-Bio	R-Other	NR-M	R-M	Water	NH-W	H-W
	kg CO <sub>2</sub> eq	kg SO <sub>2</sub> eq	kg N eq	kg O <sub>3</sub> eq	kg CFC-11 eq	MJ	MJ	MJ	MJ	kg	kg	m <sup>3</sup>	kg	kg
1	758	1.59	1.00	26.2	1.05E-04	13,053	306	327	300	1,020	17.5	2.54	9.04	0.02
2	766	1.63	1.02	26.8	1.05E-04	13,134	303	327	302	930	17.5	2.71	9.02	0.02
3	774	1.77	1.02	31.3	1.05E-04	13,278	299	326	299	1,542	17.5	2.61	9.11	0.02
4	778	1.83	1.02	32.5	1.05E-04	13,347	303	327	300	1,353	17.5	2.59	9.10	0.02
5	784	1.88	1.03	34.2	1.05E-04	13,423	307	327	302	1,467	17.5	2.68	9.15	0.02
6	795	1.95	1.05	35.0	1.05E-04	13,541	323	329	308	1,311	17.6	2.90	9.10	0.02
7	807	2.12	1.05	39.4	1.05E-04	13,723	312	328	309	1,276	17.6	3.00	9.19	0.02
8	816	2.03	1.15	36.1	1.08E-04	13,733	458	338	341	1,457	18.2	3.38	9.10	0.02
9	840	2.06	1.28	34.5	1.11E-04	13,916	619	349	385	1,169	18.9	4.20	9.05	0.02
10	898	2.47	1.42	43.1	1.15E-04	14,574	762	360	426	1,443	19.5	5.17	9.08	0.02

\* The range between the highest and lowest impact value is <10% for all but one environmental impact indicator, nonrenewable, nuclear (NR-N) for color group 5 which is <14.

# Environmental Product Declaration

## Life Cycle Impact Assessment

### Results - Paver Bricks

Table 16: Paver Kiln 3 average\* impact results per m<sup>3</sup> for each color group

Color Group	Environmental Impact Potential					Primary Energy Consumption				Material Resources Consumption			Wastes	
	GWP	AP	EP	SP	OP	NR-F	NR-N	R-Bio	R-Other	NR-M	R-M	Water	NH-W	H-W
	kg CO2 eq	kg SO2 eq	kg N eq	kg O3 eq	kg CFC-11 eq	MJ	MJ	MJ	MJ	kg	kg	m3	kg	kg
1	667	1.51	0.99	25.6	9.04E-05	11,399	302	327	299	1,020	17.5	2.54	9.04	0.01
2	674	1.55	1.01	26.1	9.07E-05	11,480	299	327	301	930	17.5	2.70	9.02	0.02
3	682	1.69	1.00	30.6	9.04E-05	11,624	295	326	299	1,542	17.5	2.61	9.11	0.01
4	687	1.74	1.01	31.9	9.04E-05	11,693	299	327	300	1,353	17.5	2.58	9.10	0.01
5	693	1.80	1.02	33.6	9.06E-05	11,769	303	327	301	1,467	17.5	2.67	9.15	0.02
6	703	1.86	1.04	34.3	9.12E-05	11,887	319	329	307	1,311	17.6	2.89	9.10	0.02
7	715	2.04	1.04	38.8	9.11E-05	12,069	308	328	308	1,276	17.6	3.00	9.19	0.02
8	724	1.95	1.13	35.4	9.36E-05	12,079	454	338	340	1,456	18.2	3.37	9.10	0.02
9	749	1.98	1.27	33.9	9.70E-05	12,262	615	349	384	1,169	18.9	4.19	9.05	0.02
10	807	2.39	1.41	42.5	1.00E-04	12,920	758	360	425	1,443	19.5	5.17	9.08	0.02

\* The range between the highest and lowest impact value is <10% for all but one environmental impact indicator, nonrenewable, nuclear (NR-N) for color group 5 which is <14.

Table 17: Paver Kiln 4 average\* impact results per m<sup>3</sup> for each color group

Color Group	Environmental Impact Potential					Primary Energy Consumption				Material Resources Consumption			Wastes	
	GWP	AP	EP	SP	OP	NR-F	NR-N	R-Bio	R-Other	NR-M	R-M	Water	NH-W	H-W
	kg CO2 eq	kg SO2 eq	kg N eq	kg O3 eq	kg CFC-11 eq	MJ	MJ	MJ	MJ	kg	kg	m3	kg	kg
1	758	1.59	1.00	26.2	1.05E-04	13,053	306	327	300	1,020	17.5	2.54	9.04	0.02
2	766	1.63	1.02	26.8	1.05E-04	13,134	303	327	302	930	17.5	2.71	9.02	0.02
3	774	1.77	1.02	31.3	1.05E-04	13,278	299	326	299	1,542	17.5	2.61	9.11	0.02
4	778	1.83	1.02	32.5	1.05E-04	13,347	303	327	300	1,353	17.5	2.59	9.10	0.02
5	784	1.88	1.03	34.2	1.05E-04	13,423	307	327	302	1,467	17.5	2.68	9.15	0.02
6	795	1.95	1.05	35.0	1.05E-04	13,541	323	329	308	1,311	17.6	2.90	9.10	0.02
7	807	2.12	1.05	39.4	1.05E-04	13,723	312	328	309	1,276	17.6	3.00	9.19	0.02
8	816	2.03	1.15	36.1	1.08E-04	13,733	458	338	341	1,457	18.2	3.38	9.10	0.02
9	840	2.06	1.28	34.5	1.11E-04	13,916	619	349	385	1,169	18.9	4.20	9.05	0.02
10	898	2.47	1.42	43.1	1.15E-04	14,574	762	360	426	1,443	19.5	5.17	9.08	0.02

\* The range between the highest and lowest impact value is <10% for all but one environmental impact indicator, nonrenewable, nuclear (NR-N) for color group 5 which is <14.

# Environmental Product Declaration

## Life Cycle Impact Assessment

### Results – Pool Coping Bricks

**Table18: Pool Coping Kiln 3 average\* impact results per m<sup>3</sup> for each color group**

Color Group	Environmental Impact Potential					Primary Energy Consumption				Material Resources Consumption			Wastes	
	GWP	AP	EP	SP	OP	NR-F	NR-N	R-Bio	R-Other	NR-M	R-M	Water	NH-W	H-W
	kg CO2 eq	kg SO2 eq	kg N eq	kg O3 eq	kg CFC-11 eq	MJ	MJ	MJ	MJ	kg	kg	m3	kg	kg
1	533	1.21	0.79	20.5	7.23E-05	9,119	242	261	240	816	14.0	2.03	7.23	0.01
2	539	1.24	0.81	20.9	7.26E-05	9,184	239	262	241	744	14.0	2.16	7.22	0.01
3	546	1.35	0.80	24.5	7.23E-05	9,299	236	261	239	1,234	14.0	2.08	7.29	0.01
4	549	1.39	0.81	25.5	7.24E-05	9,355	239	261	240	1,082	14.0	2.07	7.28	0.01
5	554	1.44	0.82	26.8	7.25E-05	9,415	243	262	241	1,174	14.0	2.14	7.32	0.01
6	563	1.49	0.83	27.5	7.30E-05	9,510	255	263	246	1,049	14.1	2.31	7.28	0.01
7	572	1.63	0.83	31.1	7.29E-05	9,656	246	262	247	1,021	14.1	2.40	7.36	0.01
8	579	1.56	0.91	28.3	7.49E-05	9,663	363	270	272	1,165	14.5	2.70	7.28	0.01
9	599	1.58	1.02	27.1	7.76E-05	9,810	492	279	308	936	15.1	3.35	7.24	0.02
10	645	1.91	1.13	34.0	8.02E-05	10,337	606	288	340	1,155	15.6	4.14	7.26	0.02

\* The range between the highest and lowest impact value is <10% for all but one environmental impact indicator, nonrenewable, nuclear (NR-N) for color group 5 which is <14.

**Table 19: Pool Coping Kiln 4 average\* impact results per m<sup>3</sup> for each of the 10-color group**

Color Group	Environmental Impact Potential					Primary Energy Consumption				Material Resources Consumption			Wastes	
	GWP	AP	EP	SP	OP	NR-F	NR-N	R-Bio	R-Other	NR-M	R-M	Water	NH-W	H-W
	kg CO2 eq	kg SO2 eq	kg N eq	kg O3 eq	kg CFC-11 eq	MJ	MJ	MJ	MJ	kg	kg	m3	kg	kg
1	607	1.27	0.80	21.0	8.37E-05	10,442	245	261	240	816	14.0	2.03	7.23	0.01
2	613	1.31	0.81	21.4	8.40E-05	10,507	243	262	242	744	14.0	2.17	7.22	0.01
3	619	1.42	0.81	25.0	8.37E-05	10,622	239	261	239	1,234	14.0	2.09	7.29	0.01
4	623	1.46	0.82	26.0	8.37E-05	10,678	243	261	240	1,082	14.0	2.07	7.28	0.01
5	627	1.51	0.83	27.3	8.39E-05	10,738	246	262	241	1,174	14.0	2.14	7.32	0.01
6	636	1.56	0.84	28.0	8.43E-05	10,833	258	263	246	1,049	14.1	2.32	7.28	0.01
7	645	1.70	0.84	31.6	8.43E-05	10,979	249	263	247	1,021	14.1	2.40	7.36	0.01
8	653	1.63	0.92	28.8	8.62E-05	10,986	366	270	273	1,165	14.5	2.70	7.28	0.01
9	672	1.65	1.03	27.6	8.89E-05	11,133	495	279	308	936	15.1	3.36	7.24	0.02
10	719	1.98	1.14	34.5	9.16E-05	11,660	610	288	341	1,155	15.6	4.14	7.26	0.02

\* The range between the highest and lowest impact value is <10% for all but one environmental impact indicator, nonrenewable, nuclear (NR-N) for color group 5 which is <14.



# Environmental Product Declaration

## Additional Environmental Information

### Impacts per square foot conversion factors

As noted in this Environmental Product Declaration (EPD), the Life Cycle Assessment is in accordance with Product Category Rules (PCR) established by the brick industry. Consequently, LCA results are calculated per cubic meter. This presents a challenge when comparing with other materials as brick along with most other wall and paving materials are installed in units per square foot.

The following conversion factors have been provided as an aid to the designer in comparing similar wall materials by converting them to an impact per square foot. When comparing these values, it is also important to note that due to the 100+ year service life of brick<sup>5</sup>, addition of multiple lives of another material may be required to properly compare cradle to grave environmental impacts. The “Width” noted in the table below defines the bed depth perpendicular to the face of the wall or paving.

**Table 20: Square foot conversion factors<sup>6</sup>**

Brick Type	Width (inches)	Conversion Factor
Face Brick	3.63	0.00698
Thin Brick	0.63	0.00120
Paving Brick	2.25	0.00531
Pool Coping*	2.25	0.00346
Structural 4" Atlas	3.63	0.00596
Structural 6" Atlas	5.63	0.00763
Structural 8" Atlas	7.63	0.00955
Structural 10" Atlas	9.63	0.01205

*\*Pool Coping is converted to lineal feet not square feet*

### Recycled content

The average recycled content of Interstate Brick bricks is 10%. Interstate Brick has received ongoing “Certificates of Environmental Claims” from the National Brick Research Center (an organization of the College of Engineering and Science at Clemson University) verifying its use of recycled materials and consequent reductions in resources for manufacturing brick.

<sup>5</sup> [http://www.gobrick.com/docs/default-source/read-research-documents/Builder-Notes/builder\\_notes\\_6-how-brick-can-help-you-build-green-efficient-homes.pdf?sfvrsn=2](http://www.gobrick.com/docs/default-source/read-research-documents/Builder-Notes/builder_notes_6-how-brick-can-help-you-build-green-efficient-homes.pdf?sfvrsn=2)

<sup>6</sup> To convert results from m<sup>3</sup> to ft<sup>2</sup> multiplying the impact value found in Tables 7-19 by the conversion factor in Table 20. For example, a Group 1 Face Brick made on Line 3 with a GWP of 500(kg CO2 eq) per m<sup>3</sup> would be converted by multiplying 500 by 0.00698 or 3.49 (kg CO2 eq) per ft<sup>2</sup>.

# Environmental Product Declaration

## Additional Environmental Information

### End of Life

Brick is 100% recyclable and is frequently retained on buildings when they are completely renovated. Brick meeting ASTM Standards for Clay Brick is one of the few materials that the building codes allow to be reused in a building application.

### Product Performance

#### *Service life*

The National Institute for Standards and Technology gives brick masonry a 100-year service life. Many Interstate Brick buildings are more than a century old and still in use today.

#### *Thermal Mass*

The thermal mass of brick can reduce the heating and cooling demands of a building by storing heat energy during peak times and returning that energy.

The heat capacity of brick is 1.0 kJ/Kg°K (kilojoules per kilogram per degree Kelvin)<sup>7</sup>. This can be converted to a unit per square foot by including the mass of the unit in question for a square foot of surface area. The following table converts heat capacity to specific heat by brick type listed in the EPD.

**Table 21: Specific Heat of Brick**

Brick Type	Width (inches)	kJoules/ sq-ft °K
Face Brick	3.63	12.33
Thin Brick	0.63	2.83
Paving Brick	2.25	10.21
Pool Coping*	2.25	7.09
Structural 4" Atlas	3.63	10.36
Structural 6" Atlas	5.63	13.27
Structural 8" Atlas	7.63	16.60
Structural 10" Atlas	9.63	20.96

\*Pool Coping is converted to lineal feet not square feet

#### *Indoor air quality*

Interstate Brick’s clay bricks and pavers do not off-gas volatile organic compounds or other toxic materials.

<sup>7</sup> [https://www.engineeringtoolbox.com/specific-heat-solids-d\\_154.html](https://www.engineeringtoolbox.com/specific-heat-solids-d_154.html)

# Environmental Product Declaration

## Additional Environmental Information

### Environmental Management

#### *Air*

For over 40 years, Interstate Brick has maintained wet scrubbers to clean kiln exhausts. Recent proprietary company scrubber modifications set Interstate Brick as the MACT standard for the brick industry. Interstate Brick scrubbers are over 99% efficient in reducing air pollutants.

The Maximum Achievable Control Technology (MACT) standard is a level of control that was introduced by Title III of the 1990 Clean Air Act Amendments. The purpose of these Amendments was to expedite the development of standards that would reduce hazardous air pollutant (HAP) emissions.

#### *Water*

Interstate Brick's proficiency in reducing air pollutants enhanced the development of wastewater management onsite. Interstate Brick has constructed and maintains their own water treatment plant. Effluents from the scrubbers are further processed onsite to tertiary standards in order to reduce the environmental impact on the surrounding area. Solids are captured and recycled back into the brick making process.

Best Management Practices (BMP) and monthly responsibilities such as catch basin filters, monthly water sampling, and monthly inspections are in place to ensure the storm water and processed water are all treated correctly.

# Environmental Product Declaration

## Abbreviations

The following abbreviations are used throughout the EPD:

A1	Raw Material supply module of product stage of an EPD
A2	Transportation module of product stage of an EPD
A3	Manufacturing module of product stage of an EPD
AP	Acidification Potential
CFC-11 eq	Trichlorofluoromethane equivalence
CO <sub>2</sub> eq	Carbon Dioxide equivalence
EP	Eutrophication Potential
EPD	Environmental Product Declaration
GWP	Global Warming Potential
H-W	Hazardous Waste
HHV	Higher Heating Value
ISO	International Organization for Standardization
kg	Kilogram
lb	Pounds
LCA	Life Cycle Assessment
LCI	Life Cycle Inventory
m <sup>3</sup>	Cubic Meter
MJ	Mega Joule
N eq	Nitrogen equivalence
NH-W	Non-hazardous Waste
NR-F	Non-renewable Fossil
NR-M	Non-renewable Material
NR-N	Non-renewable Nuclear
O <sub>3</sub> eq	Ozone equivalence
OP	Ozone Depletion Potential
pcf	Pounds per cubic foot
PCR	Product Category Rule
R-Bio	Renewable Biomass
R-M	Renewable Material
R-other	Renewable (solar, wind, hydroelectric and geothermal)
SO <sub>2</sub> eq	Sulfur Dioxide equivalence
SP	Smog Creation Potential
TRACI	Tool for the Reduction and Assessment of Chemical and other environmental Impacts
US-EI	ecoinvent process data modified to use US electricity
WEEC	Western Electricity Coordinating Council