



INTERSTATE[®] BRICK

Nothing Else Stacks Up[®]



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
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(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 (m³)

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.¹ 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 m³).² 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

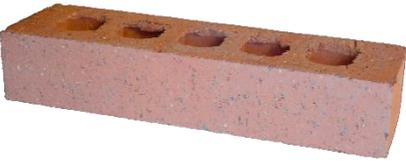
| Product Type: Clay Face Bricks | | | | | |
|--|-------------------|---|------------------|---|-------------|
|  | | Standards ASTM C216, ASTM C62 | | Description Specification for Clay Facing Brick | |
| Group | Description | Density (pcf) | Percent Void (%) | Weight/m ³ (lb) | Kiln Number |
| 1 |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

Table 2: Structural brick product description

| Product Type: Structural Bricks - Atlas™ | | | | | |
|--|---------------------------|-------------------------------|------------------|---|-------------|
|  | | Standards ASTM C652 | | Description 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 ³ (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 |
| Material Composition: clay/shale aluminum silicates (90-95%), manganese dioxide (<3%), chromite (<3%), barium carbonite (<1%) | | | | | |

¹ Each kiln has a different energy efficiency.

² Heavier bricks have higher impacts per m³, the declared unit.

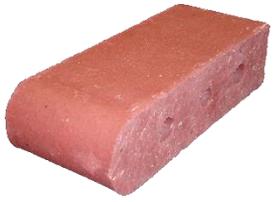
Environmental Product Declaration

Product Information

Table 3: Thin brick product description

| Product Type: Thin Brick | | | | | |
|--|-------------------|--------------------------------|------------------|--|-------------|
|  | | Standards ASTM C1088 | | Description 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 |
| Material Composition: clay/shale aluminum silicates (90-95%), manganese dioxide (<3%), chromite (<3%), barium carbonite (<1%) | | | | | |

Table 4: Pavers product description

| Product Type: Pavers | | | | | |
|--|--------------------|---|------------------|---|-------------|
|  | | Standards ASTM C902 ASTM C1272 | | Description 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 |
|  | | Standards ASTM C902 | | Description 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 |
| Material Composition: 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 impacts³.

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 |

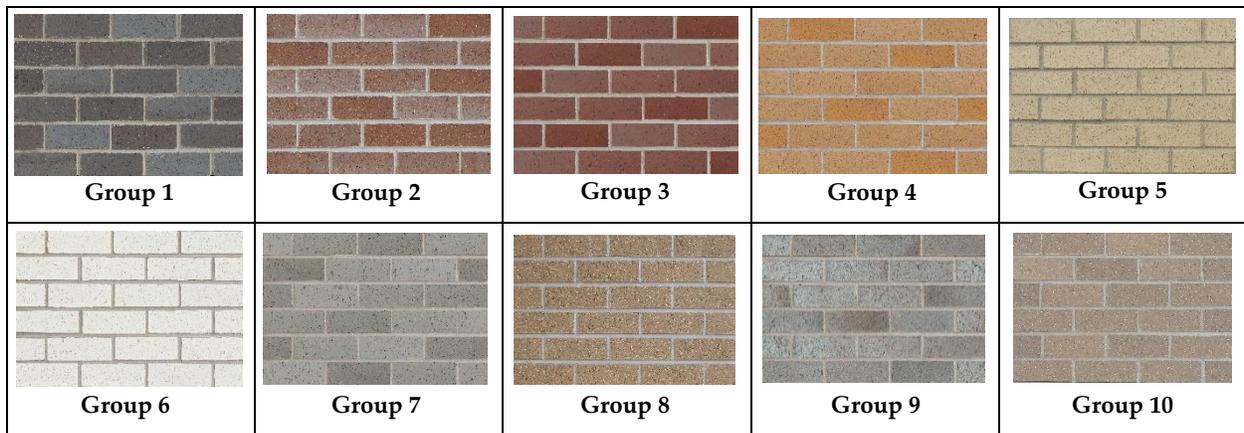


Figure 1: Base color for each color group.

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.

³ 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 <i>(Mandatory)</i> | | | 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 |
| A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | C4 |

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.

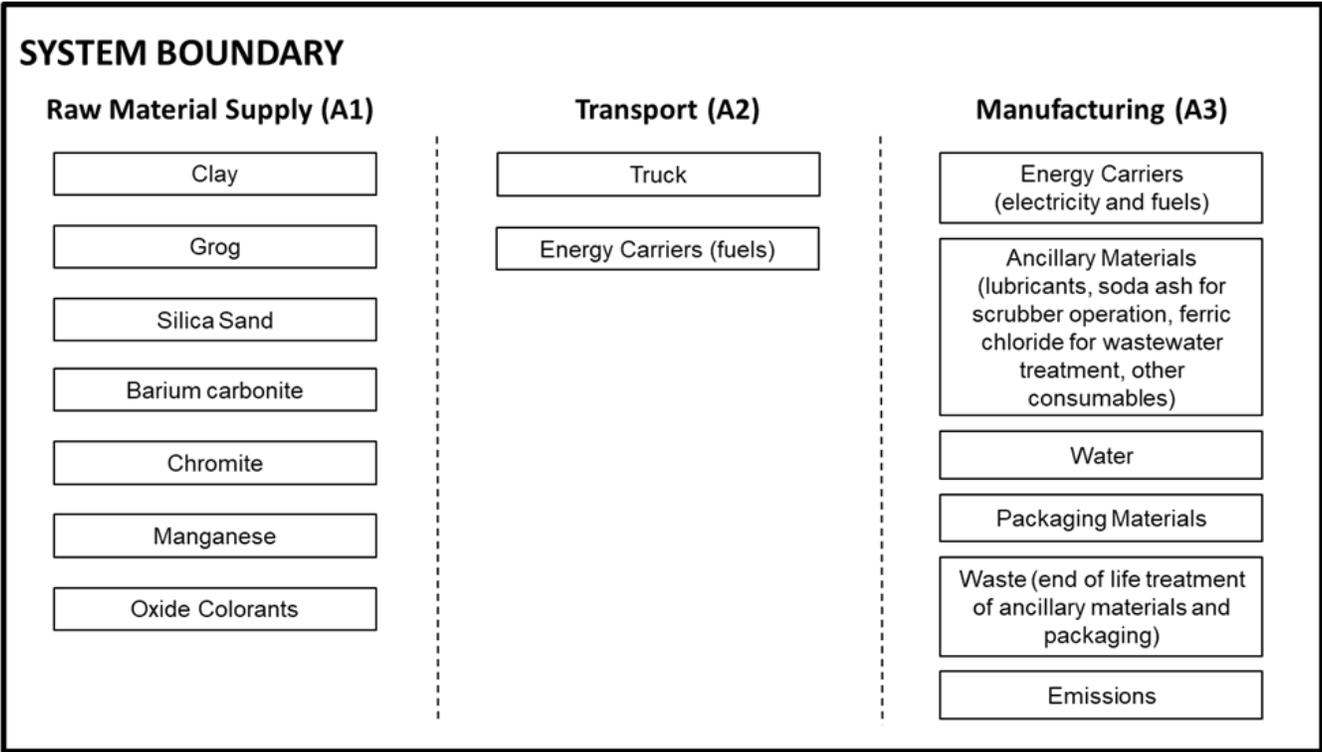


Figure 3 : Main processes included in system boundary

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 ₂ eq | GWP |
| Acidification potential | kg SO ₂ eq | AP |
| Eutrophication potential | kg N eq | EP |
| Smog creation potential | kg O ₃ 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) ⁴ | m ³ | 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 (m³), the declared unit.

⁴ 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

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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Environmental Product Declaration

Life Cycle Impact Assessment

Results - Face Bricks

Table 7: Face Brick Kiln 3 average* impact results per m³ 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 ₂ eq | kg SO ₂ eq | kg N eq | kg O ₃ eq | kg CFC-11 eq | MJ | MJ | MJ | MJ | kg | kg | m ³ | 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 m³ 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 ₂ eq | kg SO ₂ eq | kg N eq | kg O ₃ eq | kg CFC-11 eq | MJ | MJ | MJ | MJ | kg | kg | m ³ | 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 m³ 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 ₂ eq | kg SO ₂ eq | kg N eq | kg O ₃ eq | kg CFC-11 eq | MJ | MJ | MJ | MJ | kg | kg | m ³ | 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 m³ 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 ₂ eq | kg SO ₂ eq | kg N eq | kg O ₃ eq | kg CFC-11 eq | MJ | MJ | MJ | MJ | kg | kg | m ³ | 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 m³ 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 ₂ eq | kg SO ₂ eq | kg N eq | kg O ₃ eq | kg CFC-11 eq | MJ | MJ | MJ | MJ | kg | kg | m ³ | 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 m³ 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 ₂ eq | kg SO ₂ eq | kg N eq | kg O ₃ eq | kg CFC-11 eq | MJ | MJ | MJ | MJ | kg | kg | m ³ | 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 m³ 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 ₂ eq | kg SO ₂ eq | kg N eq | kg O ₃ eq | kg CFC-11 eq | MJ | MJ | MJ | MJ | kg | kg | m ³ | 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 m³ 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 ₂ eq | kg SO ₂ eq | kg N eq | kg O ₃ eq | kg CFC-11 eq | MJ | MJ | MJ | MJ | kg | kg | m ³ | 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 m³ 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 ₂ eq | kg SO ₂ eq | kg N eq | kg O ₃ eq | kg CFC-11 eq | MJ | MJ | MJ | MJ | kg | kg | m ³ | 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 m³ 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 m³ 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 brick⁵, 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 factors⁶

| 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.

⁵ 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

⁶ To convert results from m³ to ft² 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 m³ would be converted by multiplying 500 by 0.00698 or 3.49 (kg CO₂ eq) per ft².



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)⁷. 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.

⁷ 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 ₂ 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 ³ | 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 ₃ 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 ₂ 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 |