# THE GREEN STANDARD

## Environmental Product Declaration

In accordance with ISO 14025

# Solar Gard®
# Architectural Solar Control Window Film

altanova
energy + sustainability

Solar Gard®
SAINT-GOBAIN

# 1. General information

This Environmental Product Declaration provides a quantitative and verified description of the environmental performance of a set of 14 solar control window films produced by Solar Gard. It has been prepared according to The Green Standard Environmental Product Declaration System and based on production and sales data for **2010 and 2011** and the **declared unit of 1 m$^2$ of installed film**. The United Nations Central Product Classification (CPC) Code for this product is *36920: Self-adhesive plates, sheets, film, foil, tape, strip and other flat shapes, of plastics*.

This is the first EPD for this particular set of products. A prior EPD for 32 other Solar Gard window films not included in this analysis was published in 2010 based on an earlier version of the Product Category Rules, *PCR 2006:02 Building Products, 2006-02-22*. It was registered with *The International EPD® System* (#S-P-00207) and *The Green Standard* (#TGS-1020909-0911-A). With the current EPD, Solar Gard maintains its commitment to environmental responsibility by conducting life cycle analyses for the new products it develops.

| | |
|---|---|
| **EPD program:** | The Green Standard |
| **PCR:** | Product Category Rules for CPC Division (n/a): Construction Products and CPC Division 54: Construction Services, Version 1.0, 2012-01-09 |
| **PCR review was conducted by:** | Martin Erlandsson, IVL Swedish Environmental Research Institute, Sweden, *martin.erlandsson@ivl.se* |

| | |
|---|---|
| **EPD registration number:** | TGS-1020914-0512-A |
| **Publication date:** | |
| **Valid until:** | |

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

☐ Internal
☒ External
☐ EPD Process Certification

**Third party verifier:**

Carl-Otto Nevén
Five Winds International
*carl-otto.neven@fivewinds.com*
+46 31 3364954

**EPD prepared by:**

Altanova Energy + Sustainability
*www.altanova-energy.com*

## Solar Gard

Solar Gard positively impacts lives with products that protect, save and renew. Headquartered in San Diego, California, Solar Gard makes industry leading architectural and automotive window films, photovoltaics and custom coatings. A division of Saint-Gobain Performance Plastics, a subsidiary of Saint-Gobain, the world leader in the habitat and construction markets, Solar Gard's architectural solar control window films are proven carbon negative and reduce global greenhouse gas emissions. Solar Gard products are sold in more than 90 countries under the Solar Gard® and Quantum® brands. For more information, visit *www.solargard.com*.

## Saint-Gobain

Located in 64 countries and with almost 195,000 employees, Saint-Gobain is one of the world's top 100 companies. A world leader in habitat, Saint-Gobain designs, manufactures and distributes building materials, providing innovative solutions to meet the challenges of growth, energy-saving and environmental protection. For more information, please visit *www.saint-gobain.com*.

## Saint-Gobain Performance Plastics

The world leader in high performance plastics, Saint-Gobain Performance Plastics is headquartered in Aurora, Ohio (USA). The company employs 4,500 employees in 16 countries. Its product line includes films, foams, coated fabrics, seals and fluid systems. For more information, visit *www.plastics.saint-gobain.com.*

**Contact Information**

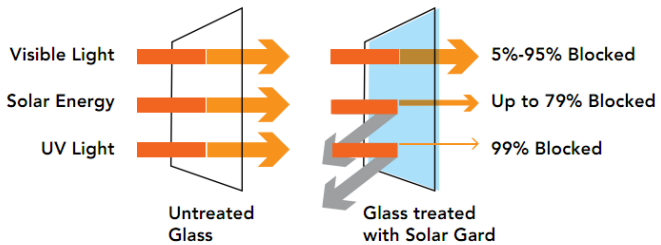
Gene Kogan
Technical Services Energy Manager
*gene.kogan@saint-gobain.com*
(858) 634-2025

Saint-Gobain Solar Gard LLC
*www.solargard.com*
4540 Viewridge Avenue
San Diego, CA 92123
(858) 576-0200

## 2. Product classification and description

Solar Gard architectural solar control window films are used in commercial and residential buildings to reduce solar heat gain while:

- Providing energy savings by reducing air-conditioner use
- Improving year-round comfort
- Protecting against ultraviolet damage and fading
- Diminishing bothersome glare
- Enhancing exterior appearance




These window films are made of complex layers of various coated materials that control how the sun's radiation passes through glass. Proprietary combinations of metals, such as stainless steel, gold, and silver, give each film its unique solar performance capability and color. Solar Gard window films are professionally installed by retro-fitting them to the inside or outside surface of glass. Outside Weatherable (OSW) films, attached to the outside, provide a solution for windows where the risks of glass breakage or seal failure are too high, or where the interior make-up of the glazing would prohibit interior application.

The films are protected with a scratch-resistant coating, inspected and put through stringent endurance tests to provide a quality product. To ensure customer satisfaction, Solar Gard offers comprehensive product warranties.

This EPD covers 14 architectural solar-control window films, each with its own thermal properties. The number in the product name corresponds to the percentage of visible light transmitted (VLT) 10, 20, 30, etc. The films are produced in four different widths. The two larger widths (60" and 72") are used to make narrower widths (36" and 48") of finished product by slitting. Interior films are made with either a pressure sensitive adhesive (PS) or a clear dry adhesive (CDA).

**Window films included in the EPD:**

| *Product Name* | *Type* | *36"* | *48"* | *60"* | *72"* |
|---|---|---|---|---|---|
| LX 40 | PS | | | ✓ | |
| Hilite® 40 | PS | | ✓ | ✓ | |
| TrueVue™ 5 | CDA | ✓ | ✓ | ✓ | ✓ |
| TrueVue™ 15 | CDA | ✓ | ✓ | ✓ | ✓ |
| TrueVue™ 30 | CDA | ✓ | ✓ | ✓ | ✓ |
| TrueVue™ 40 | CDA | ✓ | ✓ | ✓ | ✓ |
| Silver 50 AG Low-E | CDA | ✓ | ✓ | ✓ | |
| Sentinel™ 4 Mil Clear | OSW | ✓ | ✓ | ✓ | ✓ |
| Sentinel™ Silver 20 | OSW | ✓ | ✓ | ✓ | ✓ |
| Sentinel™ Silver 35 | OSW | | ✓ | ✓ | ✓ |
| Sentinel™ Stainless Steel 15 | OSW | | | ✓ | ✓ |
| Sentinel™ Stainless Steel 25 | OSW | | | ✓ | ✓ |
| Sentinel™ Stainless Steel 40 | OSW | | | ✓ | ✓ |
| Sentinel™ Stainless Steel 45 | OSW | | | ✓ | ✓ |

## 2.1 Range of application

Solar Gard architectural solar control window films can be applied to any building, including commercial and residential facilities.

## 2.2 Product standard

| | |
|---|---|
| National Fenestration Rating Council | NFRC 100-300 |
| SHGC Range | .17 – .68 |
| VLT Range | .04 – .73 |
| U-factor range | .88 – 1.102.3 |

** Sentinel Stainless Steel is not NFRC certified*

## 2.3 Accreditation

ISO9001 Quality Management System

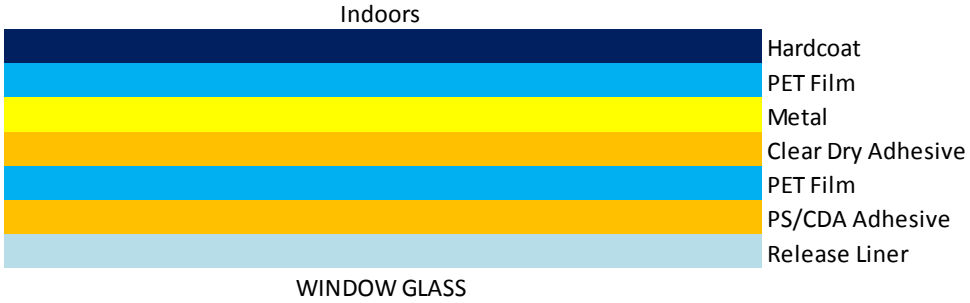
ISO14001 Environmental Management System

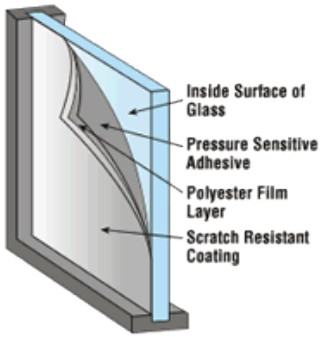
California Climate Action Leader

Clinton Climate Initiative

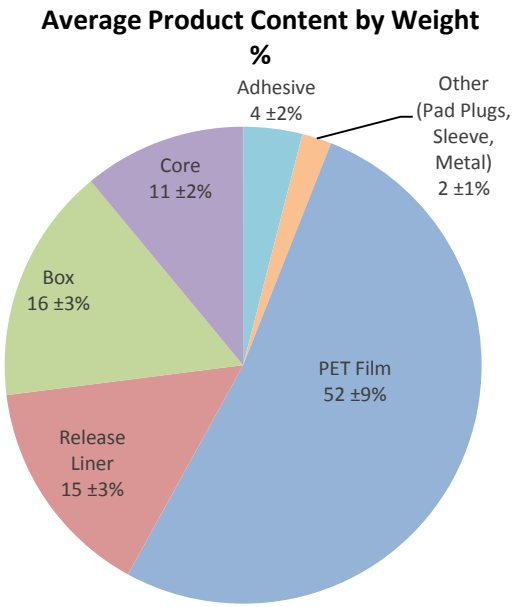
## 2.4 Product content

**Product Diagram** (general construction illustration)



- *Polyethylene terephthalate (PET) Film*: visibly clear thermoplastic polymer resin of the polyester family, derived from petroleum, and is the major component of window film. PET film is often formed through extruding and stretching processes.
- *Clear Dry Adhesive*: visibly clear adhesive that is used to combine multiple plies of PET film together.
- *Hardcoat*: scratch-resistant chemical coating that is placed on the exposed surface of the window film.
- *Metal*: thin layer of one or more metals that is sputtered onto the window film.
- *PS/CDA Adhesive*: pressure sensitive (PS) or clear dry adhesive (CDA) that is used to adhere the window film to the window.
- *Release Liner*: made from PET and used to protect the PS/CDA adhesive during storage and transportation. The release liner is removed immediately prior to installation and discarded.




## Packaging content

- *Box*: Shipping box made from 60% recycled cardboard and 40% virgin recyclable fiber.
- *Core*: a tube made of high impact polystyrene (HIPS), around which the finished roll of film is wrapped.
- *Pad Plugs*: made from polypropylene, used to support the roll in the box.
- *Polytube Sleeve*: made from low density polyethylene (LDPE), covers and protects the roll of film during shipping.

## Packaging materials

- *Box:* The corrugated paper box is comprised of 60% recycled fiber and 40% virgin fiber.
- *Core:* The core, which the final film is wrapped around, is composed of high density polystyrene (HIPS). The HIPS is processed by injection molding.
- *Pad Plug:* Pad plugs are used to cap either end of the box. The plugs are made of polypropylene and are processed by injection molding.

# 3. Production of window film

## 3.1 Production process

The films are produced by taking one or more layers of PET film, and coating one side with one or more metals (sputtering) and/or dyes. Each film has a specific amount and type of metal associated with it. The coated films are then laminated together to form a single composite film. Next, the films are coated with a variety of chemicals to ensure durability and scratch resistance. Lastly, an adhesive and a liner are applied to the film. There are two types of adhesive, a pressure-sensitive adhesive (PS), and a clear dry adhesive (CDA). The Pressure Sensitive Adhesive uses pressure to form a mechanical bond between the film and the glass it is adhering to, while the Clear Dry Adhesive uses water to activate and form a chemical bond between the glass and the film. The liner, also made from PET, protects the adhesive during storage and transportation, and is removed during installation.

## 3.2 Health, safety and environmental aspects during production

ISO 9001 Quality Management System
ISO 14004 Environmental Management System
BEARS Safety Program (Because Employees are Responsible for Safety)

# 4. Delivery and installation of window film

## 4.1 Delivery

Customer locations were organized into 25 global regions with consistent climate conditions, including 6 climate zones in the US, as defined by ASHRAE. International transportation distances for the finished products were calculated using Google Earth based on the flight or trucking distance from San Diego to a Solar Gard service center plus an average driving distance to a customer location within the country. For locations without a service center, the flight distance is to a central city in the destination country. Within the US, an average transportation distance of 1500 miles was assumed. Emissions were calculated using standard aircraft and truck emissions data from the EcoInvent v2.2 database.

## 4.2 Installation

The installation of the product involves the removal and disposal of the protective liner, cleaning of the window, and adhesion of the film to the glass. Cleaning of the window during installation is considered equivalent to routine cleaning and thus not considered as an additional impact.

### 4.3 Health, safety and environmental aspects during installation

No significant safety concerns are involved in the installation of the product. The small amount of volatile organic compounds (VOCs) released following the removal of the protective liner prior to installation are under the *de minimus* threshold and were not included in this EPD.

### 4.4 Waste

During the manufacturing, solvents are reclaimed at a rate of 7.2%, while the remaining solvent is sent to an oxidizer to be incinerated. Scrap PET from the manufacturing process is sent back to the distributers for recycling. Since the dimensions of windows vary and do not always match the widths of the Solar Gard window films, an estimated 7% of all film produced ends up discarded during installation. This discarded percentage is included in the end-of-life scenario.

### 4.5 Packaging

Finished rolls of film are packaged before leaving the manufacturing facility. The packaging is made up of four components: core, sleeve, box, and pad plugs. The finished film is wrapped around the core, a tube made of high impact polystyrene (HIPS). The sleeve, made from low density polyethylene (LDPE), covers and protects the roll of film. This assembly is placed into a box of 60% recycled cardboard and 40% virgin recyclable fiber. Pad plugs made from polypropylene are used to support the roll in the box. Other small components used in packaging, such as ink, staples, and glue, were considered to be a negligible component in both final weight and environmental impact and are thus outside the scope of this LCA.

## 5. Use stage

### 5.1 Use of window film

The use of the film is conservatively estimated for a period of 15 years for interior films and 7.5 years for exterior (OSW) films. This duration is consistent with the 12 to 22 year range for useful life for interior films determined by the International Window Film Association. The lifetime for Outside Weatherable films is lower due to the fact that weather conditions can be unpredictable and have a destructive physical effect on the film.

### 5.2 Cleaning and maintenance

Maintenance, repair, replacement and refurbishment are not expected during the lifetime and thus not considered as part of the LCA. After installation, the film does not require any special maintenance, besides occasional cleaning with water or diluted mild soap (not exceeding general routine cleaning), and no repairs are performed.

### 5.3 Prevention of structural damage

Product is intended to last for the life of the window and does not require special measures for prevention of structural damage.

### 5.4 Health aspects during usage

During the lifetime of the film installed on a window, no substantial amounts of volatile organic compounds are released, so material emission from usage is considered to be zero.

## 6. Singular Effects

### 6.1 Fire

ASTM E-84 Class A (technical equivalent to NFPA No. 255 & UL No. 723)
ASTM D-1929 Ignition Properties: Flash Ignition - 372C/702F, Self Ignition - 445C/834F, Melt Point - 249C

### 6.2 Water damage

The product coatings are impervious to moisture when applied property, sustaining no damage from water or cleaning.

### 6.3 Mechanical damage

The durable film hardcoat is tested to Taber abrasion test, according to ASTM D-1044 with a haze change result of <5%. Normal contact and cleaning of applied solar control films will not affect the product during its useful life.

# 7. End of life

## 7.1 Disposal

End-of-life scenarios used for the window film and its packaging were based on data from the EcoInvent v.2.2 database. Since disposal scenarios were available only for five countries, the EcoInvent waste scenario for Netherlands was also used for the Scandinavian region, and the scenario for Switzerland was applied to Germany and Spain, based on proximity. For all other consumer locations, the US scenario was used as a default, since no other non-European scenarios were available. The proportions of material allocated to each disposal method in the five regions are listed in the table below.

| | ***Recycling Disposal*** | | | | | | | | ***Non-Recycling*** | |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Region*** | *Paper* | *Glass* | *Textile* | *Organic Waste* | *Plastics* | *Ferrous Metals* | *Non Ferrous* | *Rubber* | *Incineration* | *Landfill* |
| US | 52% | 22% | 15% | 41% | 7% | 36% | 72% | 13% | 20% | 80% |
| UK | 33% | 47% | 13% | 29% | 3% | 47% | 10% | - | 17% | 83% |
| France | 34% | 65% | - | - | 20% | 45% | 9% | - | 53% | 47% |
| Netherlands | 72% | 68% | 32% | 50% | - | 78% | 35% | - | 92% | 8% |
| Switzerland | 69% | 92% | - | - | 82% | - | 27% | - | 88% | 12% |

# 8. Life cycle assessment

## 8.1 General

The methodology used for this LCA is consistent with the following standards: ISO 14040:2006 (Environmental management – Life cycle assessment – Principles and framework), ISO 14044:2006 (Environmental management – Life cycle assessment – Requirements and guidelines), ISO 14025:2006 (Type III environmental declarations – Principles and procedures), ISO 21930:2007 (Sustainability in building construction – Environmental declaration of building products).

## 8.2 Declared unit

The declared unit is **one square meter (1 $m^2$)** of film installed. The film is installed on an existing window with thermal properties averaged over four orientations (north, east, south, west).

## 8.3 Cut-off criteria

- Chemical components for which no data were available, with a combined weight of no more than 1% of the final product, were not included in this study.
- Chemical data deemed proprietary to some of Solar Gard's suppliers were unavailable and thus not included in this study.
- Data deemed proprietary to Solar Gard (such as the metals used) were made available for the analysis and the peer review, but have been excluded from this report.
- Refrigerant leakage was not included in the scope of this study.
- When inventory data was unavailable for use in this study, inventory data for a substitute product that is known to have a similar environmental impact was used. The majority of unavailable inventory data fell below the 1% by weight cutoff, and was excluded from the study.
- This LCA assumes that a portion of the produced film ends up discarded at the installation site due to differences in window dimensions and thus does not contribute to energy savings. Since there is no way to track the exact discarded amounts, the manufacturer's estimate of 7% has been used in calculations.

## 8.4 Allocation

For general purpose equipment and supporting departments, such as administrative office spaces, R&D and marketing, allocation has been based on the fact that the architectural solar control window films analyzed in this LCA represent 4.55% by area of the total amount of film manufactured. Therefore, 4.55% of the energy associated with the general purpose equipment and supporting facilities was allocated to the 14 window films, based on 2010-2011 production years.

## 8.5 Background data

The SimaPro v7.3.2 software and the EcoInvent v2.2 database were used for modeling the life cycle of Solar Gard window film.

## 8.6 Data quality

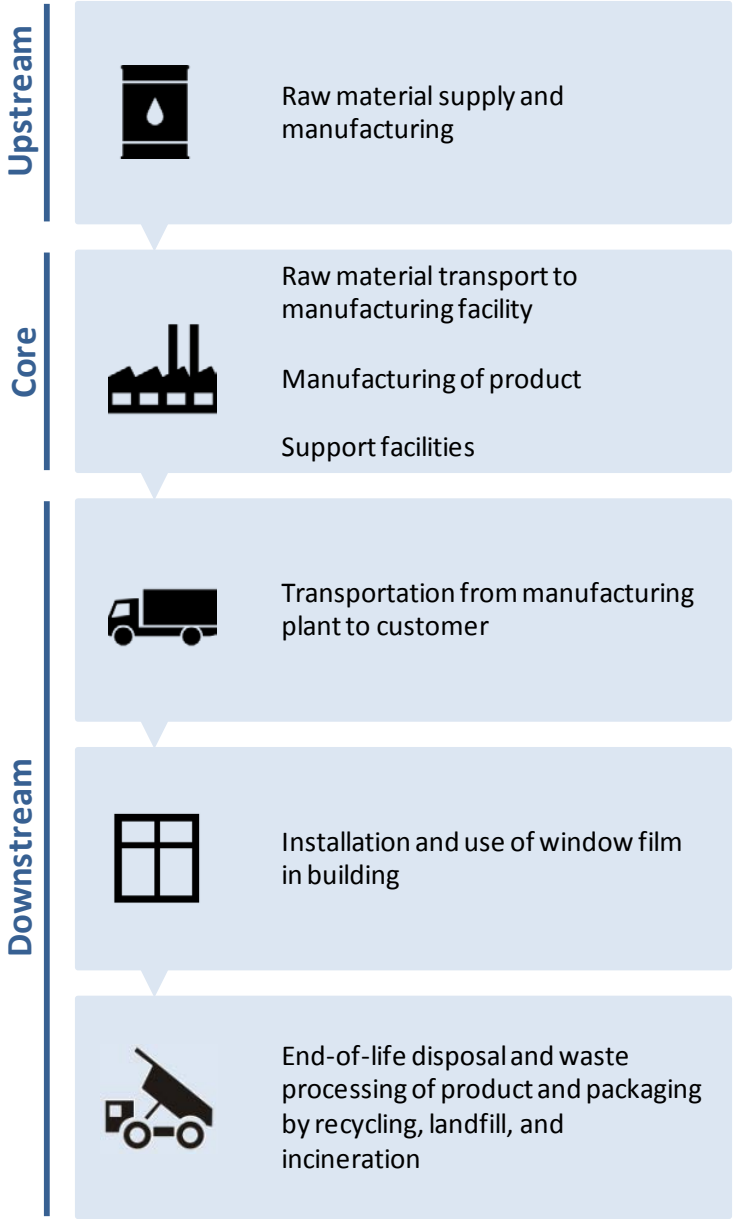
Data used for this LCA is considered to be of "good to high" quality. The data and data sets cover all relevant process steps and technologies over the supply chain of the window films. The upstream manufacturing of raw materials data IS based on the EcoInvent v2.2 database, compiled by the Swiss Center for Life Cycle Inventories and released in May 2010. All manufacturing and distribution data (except that listed in the cut-offs above), including exact amounts of material used for each product and the energy used by equipment, support facilities, and vehicles, was obtained from comprehensive bills of materials, energy bills, and sales records provided by Solar Gard for the LCA time period. Use stage data for energy savings was derived from CAPSOL, a robust simulation tool used to model a standard residential and office building in 25 climate zones around the world where the films are sold. Electricity emissions factors for each region are based on the local electricity generation mix. Transportation and end-of-life data is based on EcoInvent v2.2.

## 8.7 System boundaries

The life cycle analysis performed for this EPD includes upstream, core, and downstream stages as illustrated. It permits a "cradle-to-gate with options" EPD, comprising the entire lifecycle from raw material acquisition and transportation, window film production, transportation to customer, use, to final disposal and recycling scenarios.

## 8.8 Time boundary

Data for this LCA was collected for the 2010 and 2011 calendar years.



## 8.9 Major assumptions and calculation methods

Raw material data is based on Solar Gard's Bills of Material (BOMs) for the years 2010-2011, which quantify all the materials (packaging, plastics, metals, solvents and other chemicals) used for the production of master rolls (60" and 72" wide) for each type of window film, including scrap PET from the process that is recycled. Energy and material information was taken from the EcoInvent v2.2 database, which accounts for substances and energy employed in the extraction and processing of raw materials.

**Transport of raw materials to Solar Gard**
Transport of supplies to Solar Gard is based on standard truck delivery scenarios provided by EcoInvent v2.2 database, calculated based on distance from the point of shipment to Solar Gard and the weight of material.

**Manufacturing of product**
An audit of Solar Gard's San Diego facility in December 2009 provided the inventory of all equipment used in manufacturing of window films, including capacity, emissions, and productivity. For specific equipment involved in the manufacturing process (slitting, sputtering, metalizing, bonding, chemical mixing), energy use was calculated on the basis of equipment electrical capacity and duration of use per square meter of film. The environmental impact embodied in scrap PET was treated as an avoided product.

**Support facilities**
4.6% of the energy associated with general purpose equipment and supporting facilities was allocated to the films in this EPD, based on their percentage of total production.

Customer locations were organized into 25 global regions with consistent climate conditions, including 6 climate zones in the US, as defined by ASHRAE. International transportation distances for the finished products were calculated using Google Earth based on the flight or trucking distance from San Diego to a Solar Gard service center plus an average driving distance to a customer location within the country. For locations without a service center, the flight distance is to a central city in the destination country. Within the US, an average transportation distance of 1500 miles was assumed. Emissions were calculated using standard aircraft and truck emissions data from the EcoInvent v2.2 database.

Use stage operational energy was calculated for each type of film in each geographic zone, based on models of standard-sized commercial and residential buildings that use air conditioning simulated using CAPSOL software. Energy consumption from electricity (for cooling) and natural gas (for heating) was simulated for each building with and without solar-control window films. Energy use was taken as the weighted average of energy use from homes (30%) and from offices (70%), estimated from sales data. The net energy savings (or, in some cases, penalty) is the result of the difference between the amounts of energy required by a building without and with solar-control film.

Calculation of the end-of-life environmental impact is based on EcoInvent v2.2 data for incineration, recycling, and landfill in the geographical region where the film was sold. Since end-of-life data were available only for five countries (United Kingdom, USA, France, the Netherlands, and Switzerland), proxy data had to be used for the remaining regions in the LCA, as detailed in Section 7.1.

## 8.10 Notes on use stage

### 8.10.1 Use stage operational energy

Solar-control window film reduces the solar heat gain through the windows where it is installed, reducing the need for cooling in summer and, thus, the use of electricity by air conditioning systems. For the same reason, window films increase the need for heating in winter and, hence, the use of oil or natural gas by boilers. The difference in energy between the heating (penalty) and cooling (savings) systems of the building where the films are installed is allocated to the film on a square meter basis and labeled as *operational energy*. In the majority of cases, the operational energy for these films is negative, meaning that the energy savings from reduced cooling are higher than the energy penalty from increased heating. The extent of these savings is determined by climate conditions. For this LCA, 25 regions were considered; reference cities whose climate data was used in simulations for each region are listed on the right.

| | *LCA Climate Zone* | *Reference City* | *Included Countries* |
|---|---|---|---|
| North America | ASHRAE Zone 1,2 | Phoenix | USA, Puerto Rico, Bermuda, Cayman Islands, Dominican Rep. |
| | ASHRAE Zone 3 | Las Vegas | USA |
| | ASHRAE Zone 4 | Washington, D.C. | USA |
| | ASHRAE Zone 5 | Boston | USA |
| | ASHRAE Zone 6,7 | Denver | USA |
| | Canada | Toronto | Canada |
| | Mexico | Mexico City | Mexico |
| Europe | France | Nice | France |
| | Northern Europe | Frankfurt | Belgium, Germany, Netherlands |
| | Russia | Moscow | Russia, Latvia |
| | Scandinavia | Stockholm | Denmark, Finland, Sweden, Norway |
| | Southern Europe | Madrid | Spain, Monaco, Malta, Tunisia |
| | United Kingdom | London | England, Ireland |
| Asia and Pacific | Australia | Melbourne | Australia, New Zealand |
| | China, Mid-East Coast | Shanghai | China |
| | China, North-East | Beijing | China, South Korea |
| | China, South-East | Hong Kong | China, Taiwan, Thailand |
| | India | Bombay | India |
| | Japan | Tokyo | Japan |
| | Malaysia | Kuching | Malaysia, Philippines, Indonesia, Singapore |
| | Middle East | Riyadh | Qatar, Lebanon, Oman, UAE |
| | Turkey | Istanbul | Turkey, Cyprus |
| South America | Argentina | Buenos Aires | Argentina, Chile |
| | Brazil | Rio de Janeiro | Brazil |
| | Venezuela | Caracas | Venezuela, Panama, Curacao |

### 8.10.2 Net environmental impact

The use stage operational energy amounts can be used to compare the environmental benefit of installing a declared unit of window film in a given region to the negative environmental impacts resulting from the rest of its lifecycle (the embodied impact). The difference between the *embodied* environmental impact and the *use stage operational energy* environmental impact is the *net environmental impact,* as shown in the equation below.

**Embodied Impact** − **Use Stage Operational Energy** = **Net Impact**

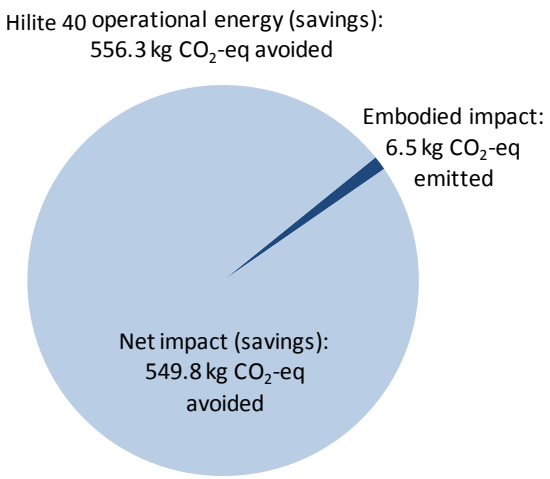
- Raw materials and their delivery to SGSG San Diego
- Manufacturing at SGSG
- Transportation to customer
- Installation
- Product end-of-life

- Cooling energy saved during summer
- Additional heating energy required in winter

- *Negative* if the environmental impact avoided during use stage is greater than the embodied impact
- *Positive* when the use of film does *not* generate enough energy savings to offset the embodied impact

### 8.10.3 Net impact of Hilite 40 film

The net impact has been calculated for each product in each customer region, and is presented in Section 10 for all EPD impact categories. As an example, the chart on the right demonstrates the global warming impact for Hilite 40 installed on a building in the USA, ASHRAE Climate Zone 4. The chart represents the $CO_2$-eq emissions avoided due to the energy savings during the use stage, and the embodied impact portion represents the emissions produced during the lifecycle. Thus, the net impact portion represents the net environmental benefit of installing one square meter of Hilite 40 film.



## 8.11 Life cycle inventory assessment

This table illustrates the consumption of natural resources per declared unit of the LX 40/ Hilite 40 film stemming from its entire lifecycle, including upstream, core, and disposal (Hilite 40 is sold under the product name LX40 outside of North America, however, they are the same product.) These include both non-renewable and renewable material and energy resources.

This table demonstrates the best- and worst-case scenario for purchased LX 40/Hilite 40 film by comparing the impacts without transportation to those that include transportation to Malaysia, one of the farthest locations from the manufacturing facility. The LX 40/Hilite 40 film is presented as the most resource-intensive, since the production of most other film types requires significantly less natural resources.

| | *Natural Resource Use for LX 40/Hilite 40 Film* | *Unit/m²* | *Transportation to consumer excluded* | *Transportation to Malaysia included* |
|---|---|---|---|---|
| Non-Renewable Resources | Corrugated board | kg | 0.009 | 0.009 |
| | Solvents | kg | 0.072 | 0.072 |
| | Plastics | kg | 0.117 | 0.117 |
| | Metals | kg | 0.173 | 0.173 |
| | **Energy Resources** | | | |
| | Fossil Fuel | MJ | 89.6 | 118.9 |
| | Nuclear | MJ | 22.0 | 22.6 |
| | Biomass | MJ | 1.05E-04 | 1.45E-04 |
| Renewable Resources | **Material Resources** | | | |
| | Water | l | 8.8E+06 | 8.8E+06 |
| | **Energy Resources** | | | |
| | BIomass | MJ | 1.189 | 1.208 |
| | Wind/Solar/Geothermal | MJ | 0.114 | 0.122 |
| Other Indicators | **Use of Recycled Material** | | | |
| | Recycled corrugated board | kg | 0.014 | 0.014 |
| | **Components for Re-use** | | | |
| | Reclaimed Solvents | kg | 0.004 | 0.004 |
| | **Materials for Recycling** | | | |
| | PET film | kg | 0.017 | 0.017 |
| | **Waste** | | | |
| | Hazardous waste | kg | 1.3E-04 | 1.4E-04 |
| | Radioactive waste | kg | 2.1E-04 | 2.2E-04 |
| | Non-hazardous waste | kg | 0.27 | 0.28 |

### 8.12 Life cycle impact assessment

The tables below (9.1–9.5) present the five categories of environmental impacts (acidification, eutrophication, global warming potential, ozone layer depletion potential, and photochemical oxidation) embodied in 1 $m^2$ of installed film, as well as the use stage operational energy of, for films of every type and width, sold and installed in each of the 25 geographic regions. A *negative* net impact indicates the emissions *avoided* by using window films, while a *positive* net impact indicates an *increase* in emissions in the region.

| | Impact Category | Unit per $m^2$ of film | Pages |
|---|---|---|---|
| 9.1 | Global Warming Potential | kg $CO_2$-eq | 10-15 |
| 9.2 | Ozone Layer Depletion | kg CFC 11-eq | 16-21 |
| 9.3 | Acidification | kg $SO_2$-eq | 22-27 |
| 9.4 | Eutrophication | kg $PO_4$-eq | 28-33 |
| 9.5 | Photochemical Oxidation | kg $C_2H_4$-eq | 34-39 |

## 9.1 Global warming potential: North America and Europe

| Global Warming Potential ($kg\ CO_2$-eq/$m^2$) | | PS Series | LX 40 | | | | Hilite 40 | | | | 4 Mil Clear | Sentinel 4 Mil Clear | | | | CDA & OSW | Silver AG 50 Low-E | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Transportation to Customer | Manufacturing | End-of-life | Operational Energy | **Net kg $CO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $CO_2$-eq** | Transportation to Customer | Manufacturing | End-of-life | Operational Energy | **Net kg $CO_2$-eq** | Transportation to Customer | Manufacturing | End-of-life | Operational Energy | **Net kg $CO_2$-eq** |
| North America | ASHRAE Climate Zone 1,2 | 36" | | | | | | | | | 0.04 | 4.02 | 0.12 | -76.91 | **-72.74** | 0.02 | 2.73 | 0.06 | -990.41 | **-987.59** |
| | | 48" | 0.03 | | | | 7.05 | 0.09 | -1092.30 | **-1085.14** | 0.04 | 3.80 | 0.12 | -76.91 | **-72.96** | 0.02 | 3.07 | 0.06 | -990.41 | **-987.26** |
| | | 60" | 0.03 | | | | 6.43 | 0.09 | -1092.30 | **-1085.75** | 0.04 | 3.97 | 0.12 | -76.91 | **-72.79** | 0.02 | 3.36 | 0.07 | -990.41 | **-986.95** |
| | | 72" | | | | | | | | | 0.04 | 4.02 | 0.12 | -76.91 | **-72.74** | 0.02 | | | | |
| | ASHRAE Climate Zone 3 | 36" | | | | | | | | | 0.04 | 4.02 | 0.12 | -151.14 | **-146.96** | 0.02 | 2.73 | 0.06 | -862.51 | **-859.69** |
| | | 48" | 0.03 | | | | 7.05 | 0.09 | -908.63 | **-901.46** | 0.04 | 3.80 | 0.12 | -151.14 | **-147.18** | 0.02 | 3.07 | 0.06 | -862.51 | **-859.36** |
| | | 60" | 0.03 | | | | 6.43 | 0.09 | -908.63 | **-902.08** | 0.04 | 3.97 | 0.12 | -151.14 | **-147.01** | 0.02 | 3.36 | 0.07 | -862.51 | **-859.06** |
| | | 72" | | | | | | | | | 0.04 | 4.02 | 0.12 | -151.14 | **-146.97** | 0.02 | | | | |
| | ASHRAE Climate Zone 4 | 36" | | | | | | | | | 0.04 | 4.02 | 0.12 | -90.08 | **-85.91** | 0.02 | 2.73 | 0.06 | -531.30 | **-528.48** |
| | | 48" | 0.03 | | | | 7.05 | 0.09 | -556.35 | **-549.18** | 0.04 | 3.80 | 0.12 | -90.08 | **-86.13** | 0.02 | 3.07 | 0.06 | -531.30 | **-528.15** |
| | | 60" | 0.03 | | | | 6.43 | 0.09 | -556.35 | **-549.80** | 0.04 | 3.97 | 0.12 | -90.08 | **-85.96** | 0.02 | 3.36 | 0.07 | -531.30 | **-527.84** |
| | | 72" | | | | | | | | | 0.04 | 4.02 | 0.12 | -90.08 | **-85.92** | 0.02 | | | | |
| | ASHRAE Climate Zone 5 | 36" | | | | | | | | | 0.04 | 4.02 | 0.12 | -81.89 | **-77.72** | 0.02 | 2.73 | 0.06 | -460.05 | **-457.24** |
| | | 48" | 0.03 | | | | 7.05 | 0.09 | -469.54 | **-462.38** | 0.04 | 3.80 | 0.12 | -81.89 | **-77.94** | 0.02 | 3.07 | 0.06 | -460.05 | **-456.91** |
| | | 60" | 0.03 | | | | 6.43 | 0.09 | -469.54 | **-462.99** | 0.04 | 3.97 | 0.12 | -81.89 | **-77.76** | 0.02 | 3.36 | 0.07 | -460.05 | **-456.60** |
| | | 72" | | | | | | | | | 0.04 | 4.02 | 0.12 | -81.89 | **-77.72** | 0.02 | | | | |
| | ASHRAE Climate Zone 6,7 | 36" | | | | | | | | | 0.04 | 4.02 | 0.12 | -99.74 | **-95.56** | 0.02 | 2.73 | 0.06 | -567.91 | **-565.09** |
| | | 48" | 0.03 | | | | 7.05 | 0.09 | -585.33 | **-578.16** | 0.04 | 3.80 | 0.12 | -99.74 | **-95.78** | 0.02 | 3.07 | 0.06 | -567.91 | **-564.76** |
| | | 60" | 0.03 | | | | 6.43 | 0.09 | -585.33 | **-578.78** | 0.04 | 3.98 | 0.12 | -99.74 | **-95.60** | 0.02 | 3.36 | 0.07 | -567.91 | **-564.46** |
| | | 72" | | | | | | | | | 0.04 | 4.02 | 0.12 | -99.74 | **-95.57** | 0.02 | | | | |
| | Canada | 36" | | | | | | | | | 0.13 | | | | | 0.08 | 2.73 | 0.06 | -24.71 | **-21.84** |
| | | 48" | 0.10 | | | | 7.05 | 0.09 | 55.43 | **62.67** | 0.13 | | | | | 0.07 | 3.07 | 0.06 | -24.71 | **-21.51** |
| | | 60" | 0.10 | | | | 6.43 | 0.09 | 55.43 | **62.05** | 0.13 | | | | | 0.08 | 3.36 | 0.07 | -24.71 | **-21.20** |
| | | 72" | | | | | | | | | 0.13 | | | | | 0.08 | | | | |
| | Mexico | 36" | | | | | | | | | 0.04 | 4.02 | 0.12 | -65.81 | **-61.64** | 0.02 | 2.73 | 0.06 | -354.89 | **-352.08** |
| | | 48" | | | | | | | | | 0.04 | 3.80 | 0.12 | -65.81 | **-61.86** | 0.02 | 3.07 | 0.06 | -354.89 | **-351.74** |
| | | 60" | | | | | | | | | 0.04 | 3.97 | 0.12 | -65.81 | **-61.69** | 0.02 | 3.36 | 0.07 | -354.89 | **-351.44** |
| | | 72" | | | | | | | | | 0.04 | 4.02 | 0.12 | -65.81 | **-61.64** | 0.02 | | | | |
| Europe | France | 36" | | | | | | | | | 1.70 | 4.02 | 0.18 | -6.19 | **-0.30** | 1.00 | 2.18 | 0.10 | -36.95 | **-33.67** |
| | | 48" | | | | | 7.05 | 0.14 | -28.73 | | 1.67 | 3.80 | 0.18 | -6.19 | **-0.54** | 0.98 | 3.07 | 0.10 | -36.95 | **-32.80** |
| | | 60" | | | | | | | | | 1.70 | 3.97 | 0.18 | -6.19 | **-0.34** | 1.01 | 3.36 | 0.11 | -36.95 | **-32.47** |
| | | 72" | | | | | | | | | 1.69 | 4.02 | 0.18 | -6.19 | **-0.31** | 0.99 | | | | |
| | Northern Europe | 36" | | | | | | | | | 1.73 | 4.02 | 0.09 | -48.32 | **-42.48** | 1.02 | 2.73 | 0.07 | -313.74 | **-309.91** |
| | | 48" | 1.35 | | | | 7.05 | 0.09 | -281.02 | | 1.71 | 3.80 | 0.09 | -48.32 | **-42.72** | 1.00 | 3.07 | 0.07 | -313.74 | **-309.60** |
| | | 60" | 1.38 | 6.43 | 0.08 | -281.02 | **-273.13** | | | | 1.73 | 3.97 | 0.09 | -48.32 | **-42.53** | 1.03 | 3.36 | 0.07 | -313.74 | **-309.28** |
| | | 72" | | | | | | | | | 1.72 | 4.02 | 0.09 | -48.32 | **-42.50** | 1.01 | | | | |
| | Russia | 36" | | | | | | | | | | | | | | 1.08 | | | | |
| | | 48" | | | | | | | | | | | | | | 1.05 | | | | |
| | | 60" | | | | | | | | | | | | | | 1.08 | | | | |
| | | 72" | | | | | | | | | | | | | | 1.06 | | | | |
| | Scandivania | 36" | | | | | | | | | 1.66 | 4.02 | 0.33 | -16.79 | **-10.78** | 0.99 | 2.73 | 0.18 | -149.64 | **-145.74** |
| | | 48" | 1.30 | | | | 7.05 | 0.25 | -76.88 | | 1.64 | 3.80 | 0.33 | -16.79 | **-11.02** | 0.96 | 3.07 | 0.18 | -149.64 | **-145.43** |
| | | 60" | 1.33 | 6.43 | 0.25 | -76.88 | **-68.87** | | | | 1.67 | 3.97 | 0.32 | -16.79 | **-10.82** | 0.99 | 3.36 | 0.20 | -149.64 | **-145.09** |
| | | 72" | | | | | | | | | 1.65 | 4.02 | 0.32 | -16.79 | **-10.80** | 0.97 | | | | |
| | Southern Europe | 36" | | | | | | | | | 1.73 | 4.02 | 0.09 | -80.37 | **-74.53** | 1.02 | | | | |
| | | 48" | | | | | | | | | 1.71 | 3.80 | 0.09 | -80.37 | **-74.77** | 1.00 | | | | |
| | | 60" | | | | | | | | | 1.73 | 3.97 | 0.09 | -80.37 | **-74.57** | 1.03 | | | | |
| | | 72" | | | | | | | | | 1.72 | 4.02 | 0.09 | -80.37 | **-74.54** | 1.01 | | | | |
| | United Kingdom | 36" | | | | | | | | | 1.63 | 4.02 | 0.11 | -38.98 | **-33.21** | 0.97 | 2.73 | 0.06 | -269.06 | **-265.30** |
| | | 48" | 1.28 | | | | 7.05 | 0.08 | -271.44 | | 1.61 | 3.80 | 0.11 | -38.98 | **-33.45** | 0.95 | 3.07 | 0.06 | -269.06 | **-264.99** |
| | | 60" | 1.30 | 6.42 | 0.08 | -271.44 | **-263.64** | | | | 1.64 | 3.97 | 0.11 | -38.98 | **-33.25** | 0.97 | 3.36 | 0.10 | -269.06 | **-264.62** |
| | | 72" | | | | | | | | | 1.62 | 4.02 | 0.11 | -38.98 | **-33.23** | 0.95 | | | | |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

## 9.1 Global warming potential: North America and Europe (cont.)

| Global Warming Potential (kg $CO_2$-eq/$m^2$) | | | CDA & OSW | TrueVue 5 | | | | TrueVue 15 | | | | TrueVue 30 | | | | TrueVue 40 | | | | Sentinel Silver 20 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Transportation to Customer | Manufacturing | End-of-life | Operational Energy | **Net kg $CO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $CO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $CO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $CO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $CO_2$-eq** |
| North America | ASHRAE Climate Zone 1,2 | 36" | 0.02 | 3.31 | 0.06 | -1606.08 | **-1602.68** | 3.28 | 0.06 | -1553.39 | **-1550.02** | 3.24 | 0.06 | -1105.35 | **-1102.03** | 3.22 | 0.06 | -865.06 | **-861.75** | 3.21 | 0.06 | -853.99 | **-850.69** |
| | | 48" | 0.02 | 3.24 | 0.06 | -1606.08 | **-1602.76** | 3.24 | 0.06 | -1553.39 | **-1550.07** | 3.16 | 0.06 | -1105.35 | **-1102.10** | 3.15 | 0.06 | -865.06 | **-861.83** | 3.12 | 0.06 | -853.99 | **-850.78** |
| | | 60" | 0.02 | 3.32 | 0.06 | -1606.08 | **-1602.68** | 3.32 | 0.06 | -1553.39 | **-1549.99** | 3.26 | 0.06 | -1105.35 | **-1102.01** | 3.24 | 0.06 | -865.06 | **-861.73** | 3.23 | 0.06 | -853.99 | **-850.67** |
| | | 72" | 0.02 | 3.28 | 0.06 | -1606.08 | **-1602.71** | 3.28 | 0.06 | -1553.39 | **-1550.03** | 3.23 | 0.06 | -1105.35 | **-1102.03** | 3.22 | 0.06 | -865.06 | **-861.76** | 3.21 | 0.06 | -853.99 | **-850.70** |
| | ASHRAE Climate Zone 3 | 36" | 0.02 | 3.31 | 0.06 | -1326.61 | **-1323.21** | 3.28 | 0.06 | -1295.11 | **-1291.74** | 3.24 | 0.06 | -927.18 | **-923.86** | 3.22 | 0.06 | -741.50 | **-738.19** | 3.21 | 0.06 | -800.22 | **-796.92** |
| | | 48" | 0.02 | 3.24 | 0.06 | -1326.61 | **-1323.29** | 3.24 | 0.06 | -1295.11 | **-1291.78** | 3.16 | 0.06 | -927.18 | **-923.94** | 3.15 | 0.06 | -741.50 | **-738.26** | 3.12 | 0.06 | -800.22 | **-797.01** |
| | | 60" | 0.02 | 3.32 | 0.06 | -1326.61 | **-1323.21** | 3.32 | 0.06 | -1295.11 | **-1291.71** | 3.26 | 0.06 | -927.18 | **-923.84** | 3.24 | 0.06 | -741.50 | **-738.17** | 3.22 | 0.06 | -800.22 | **-796.91** |
| | | 72" | 0.02 | 3.28 | 0.06 | -1326.61 | **-1323.25** | 3.28 | 0.06 | -1295.11 | **-1291.74** | 3.23 | 0.06 | -927.18 | **-923.87** | 3.22 | 0.06 | -741.50 | **-738.20** | 3.21 | 0.06 | -800.22 | **-796.93** |
| | ASHRAE Climate Zone 4 | 36" | 0.02 | 3.31 | 0.06 | -786.42 | **-783.02** | 3.28 | 0.06 | -765.68 | **-762.31** | 3.24 | 0.06 | -565.75 | **-562.43** | 3.22 | 0.06 | -446.39 | **-443.08** | 3.21 | 0.06 | -464.80 | **-461.51** |
| | | 48" | 0.02 | 3.24 | 0.06 | -786.42 | **-783.10** | 3.24 | 0.06 | -765.68 | **-762.35** | 3.16 | 0.06 | -565.75 | **-562.50** | 3.15 | 0.06 | -446.39 | **-443.16** | 3.12 | 0.06 | -464.80 | **-461.60** |
| | | 60" | 0.02 | 3.32 | 0.06 | -786.42 | **-783.02** | 3.32 | 0.06 | -765.68 | **-762.27** | 3.26 | 0.06 | -565.75 | **-562.41** | 3.24 | 0.06 | -446.39 | **-443.06** | 3.22 | 0.06 | -464.80 | **-461.49** |
| | | 72" | 0.02 | 3.28 | 0.06 | -786.42 | **-783.06** | 3.28 | 0.06 | -765.68 | **-762.31** | 3.23 | 0.06 | -565.75 | **-562.43** | 3.22 | 0.06 | -446.39 | **-443.09** | 3.21 | 0.06 | -464.80 | **-461.51** |
| | ASHRAE Climate Zone 5 | 36" | 0.02 | 3.31 | 0.06 | -630.00 | **-626.60** | 3.28 | 0.06 | -618.27 | **-614.90** | 3.24 | 0.06 | -467.14 | **-463.83** | 3.22 | 0.06 | -384.10 | **-380.80** | 3.21 | 0.06 | -360.48 | **-357.18** |
| | | 48" | 0.02 | 3.24 | 0.06 | -630.00 | **-626.68** | 3.24 | 0.06 | -618.27 | **-614.95** | 3.16 | 0.06 | -467.14 | **-463.90** | 3.15 | 0.06 | -384.10 | **-380.87** | 3.12 | 0.06 | -360.48 | **-357.27** |
| | | 60" | 0.02 | 3.32 | 0.06 | -630.00 | **-626.60** | 3.32 | 0.06 | -618.27 | **-614.87** | 3.26 | 0.06 | -467.14 | **-463.81** | 3.24 | 0.06 | -384.10 | **-380.78** | 3.22 | 0.06 | -360.48 | **-357.17** |
| | | 72" | 0.02 | 3.28 | 0.06 | -630.00 | **-626.63** | 3.28 | 0.06 | -618.27 | **-614.91** | 3.23 | 0.06 | -467.14 | **-463.83** | 3.22 | 0.06 | -384.10 | **-380.81** | 3.21 | 0.06 | -360.48 | **-357.19** |
| | ASHRAE Climate Zone 6,7 | 36" | 0.02 | 3.31 | 0.06 | -792.05 | **-788.65** | 3.28 | 0.06 | -764.69 | **-761.32** | 3.24 | 0.06 | -592.72 | **-589.40** | 3.22 | 0.06 | -487.29 | **-483.99** | 3.21 | 0.06 | -451.49 | **-448.20** |
| | | 48" | 0.02 | 3.24 | 0.06 | -792.05 | **-788.73** | 3.24 | 0.06 | -764.69 | **-761.37** | 3.16 | 0.06 | -592.72 | **-589.47** | 3.15 | 0.06 | -487.29 | **-484.06** | 3.12 | 0.06 | -451.49 | **-448.29** |
| | | 60" | 0.02 | 3.32 | 0.06 | -792.05 | **-788.65** | 3.32 | 0.06 | -764.69 | **-761.29** | 3.26 | 0.06 | -592.72 | **-589.38** | 3.24 | 0.06 | -487.29 | **-483.96** | 3.22 | 0.06 | -451.49 | **-448.19** |
| | | 72" | 0.02 | 3.28 | 0.06 | -792.05 | **-788.69** | 3.28 | 0.06 | -764.69 | **-761.33** | 3.23 | 0.06 | -592.72 | **-589.40** | 3.22 | 0.06 | -487.29 | **-483.99** | 3.21 | 0.06 | -451.49 | **-448.20** |
| | Canada | 36" | 0.08 | 3.31 | 0.06 | 111.26 | **114.71** | 3.28 | 0.06 | 97.18 | **100.61** | 3.24 | 0.06 | 59.59 | **62.96** | 3.22 | 0.06 | 46.21 | **49.57** | 3.21 | 0.06 | 108.44 | **111.79** |
| | | 48" | 0.07 | 3.24 | 0.06 | 111.26 | **114.63** | 3.24 | 0.06 | 97.18 | **100.56** | 3.16 | 0.06 | 59.59 | **62.89** | 3.15 | 0.06 | 46.21 | **49.49** | 3.12 | 0.06 | 108.44 | **111.70** |
| | | 60" | 0.08 | 3.32 | 0.06 | 111.26 | **114.71** | 3.32 | 0.06 | 97.18 | **100.64** | 3.26 | 0.06 | 59.59 | **62.98** | 3.24 | 0.06 | 46.21 | **49.59** | 3.22 | 0.06 | 108.44 | **111.80** |
| | | 72" | 0.08 | 3.28 | 0.06 | 111.26 | **114.68** | 3.28 | 0.06 | 97.18 | **100.60** | 3.23 | 0.06 | 59.59 | **62.96** | 3.22 | 0.06 | 46.21 | **49.56** | 3.21 | 0.06 | 108.44 | **111.79** |
| | Mexico | 36" | 0.02 | | | | | | | | | | | | | | | | | 3.21 | 0.06 | -356.04 | **-352.75** |
| | | 48" | 0.02 | | | | | | | | | | | | | | | | | 3.12 | 0.06 | -356.04 | **-352.84** |
| | | 60" | 0.02 | | | | | | | | | | | | | | | | | 3.22 | 0.06 | -356.04 | **-352.74** |
| | | 72" | 0.02 | | | | | | | | | | | | | | | | | 3.21 | 0.06 | -356.04 | **-352.76** |
| Europe | France | 36" | 1.00 | | | | | | | | | | | | | | | | | 3.21 | 0.10 | -11.22 | **-6.91** |
| | | 48" | 0.98 | | | | | | | | | | | | | | | | | 3.12 | 0.10 | -11.22 | **-7.02** |
| | | 60" | 1.01 | | | | | | | | | | | | | | | | | 3.22 | 0.10 | -11.22 | **-6.89** |
| | | 72" | 0.99 | | | | | | | | | | | | | | | | | 3.21 | 0.09 | -11.22 | **-6.93** |
| | Northern Europe | 36" | 1.02 | | | | | | | | | | | | | | | | | 3.21 | 0.07 | -220.66 | **-216.36** |
| | | 48" | 1.00 | | | | | | | | | | | | | | | | | 3.12 | 0.07 | -220.66 | **-216.47** |
| | | 60" | 1.03 | | | | | | | | | | | | | | | | | 3.22 | 0.07 | -220.66 | **-216.34** |
| | | 72" | 1.01 | | | | | | | | | | | | | | | | | 3.21 | 0.07 | -220.66 | **-216.38** |
| | Russia | 36" | 1.08 | | | | | | | | | | | | | | | | | 3.21 | 0.06 | 13.76 | **18.11** |
| | | 48" | 1.05 | | | | | | | | | | | | | | | | | 3.12 | 0.06 | 13.76 | **18.00** |
| | | 60" | 1.08 | | | | | | | | | | | | | | | | | 3.22 | 0.06 | 13.76 | **18.12** |
| | | 72" | 1.06 | | | | | | | | | | | | | | | | | 3.21 | 0.06 | 13.76 | **18.09** |
| | Scandivania | 36" | 0.99 | 3.31 | 0.18 | -79.60 | **-75.12** | 3.28 | 0.18 | -91.56 | **-87.11** | | | | | | | | | 3.21 | 0.18 | -37.16 | **-32.78** |
| | | 48" | 0.96 | 3.24 | 0.18 | -79.60 | **-75.22** | 3.24 | 0.18 | -91.56 | **-87.17** | | | | | | | | | 3.12 | 0.18 | -37.16 | **-32.90** |
| | | 60" | 0.99 | 3.32 | 0.18 | -79.60 | **-75.12** | 3.32 | 0.18 | -91.56 | **-87.07** | | | | | | | | | 3.22 | 0.18 | -37.16 | **-32.77** |
| | | 72" | 0.97 | 3.28 | 0.18 | -79.60 | **-75.17** | 3.28 | 0.18 | -91.56 | **-87.13** | | | | | | | | | 3.21 | 0.18 | -37.16 | **-32.81** |
| | Southern Europe | 36" | 1.02 | | | | | | | | | | | | | | | | | 3.21 | 0.07 | -406.87 | **-402.56** |
| | | 48" | 1.00 | | | | | | | | | | | | | | | | | 3.12 | 0.07 | -406.87 | **-402.68** |
| | | 60" | 1.03 | | | | | | | | | | | | | | | | | 3.22 | 0.07 | -406.87 | **-402.55** |
| | | 72" | 1.01 | | | | | | | | | | | | | | | | | 3.21 | 0.07 | -406.87 | **-402.58** |
| | United Kingdom | 36" | 0.97 | 3.31 | 0.06 | -365.28 | **-360.94** | 3.28 | 0.06 | -366.26 | **-361.96** | 3.24 | 0.06 | -280.19 | **-275.93** | 3.22 | 0.06 | -219.99 | **-215.75** | 3.21 | 0.06 | -233.33 | **-229.10** |
| | | 48" | 0.95 | 3.24 | 0.06 | -365.28 | **-361.04** | 3.24 | 0.06 | -366.26 | **-362.02** | 3.16 | 0.06 | -280.19 | **-276.02** | 3.15 | 0.06 | -219.99 | **-215.84** | 3.12 | 0.06 | -233.33 | **-229.21** |
| | | 60" | 0.97 | 3.32 | 0.06 | -365.28 | **-360.94** | 3.32 | 0.06 | -366.26 | **-361.92** | 3.26 | 0.06 | -280.19 | **-275.90** | 3.24 | 0.06 | -219.99 | **-215.72** | 3.22 | 0.06 | -233.33 | **-229.08** |
| | | 72" | 0.95 | 3.28 | 0.06 | -365.28 | **-360.99** | 3.28 | 0.06 | -366.26 | **-361.97** | 3.23 | 0.06 | -280.19 | **-275.94** | 3.22 | 0.06 | -219.99 | **-215.77** | 3.21 | 0.06 | -233.33 | **-229.11** |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

## 9.1 Global warming potential: North America and Europe (cont.)

| Global Warming Potential (kg $CO_2$-eq/$m^2$) | | CDA & OSW Transportation to Customer | Sentinel Silver 35 | | | | Sentinel Stainless Steel 15 | | | | Sentinel Stainless Steel 25 | | | | Sentinel Stainless Steel 40 | | | | Sentinel Stainless Steel 45 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Manufacturing | End-of-life | Operational Energy | **Net kg $CO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $CO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $CO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $CO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $CO_2$-eq** |
| North America | ASHRAE Climate Zone 1,2 | 36" | 0.02 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 0.02 | 3.09 | 0.06 | -675.04 | **-671.86** | | | | | | | | | | | | | | | |
| | | 60" | 0.02 | 3.20 | 0.06 | -675.04 | **-671.76** | 3.29 | 0.06 | -746.99 | **-743.61** | 3.23 | 0.06 | -627.10 | **-623.78** | 3.20 | 0.06 | -467.07 | **-463.78** | 3.19 | 0.06 | -398.09 | **-394.81** |
| | | 72" | 0.02 | 3.19 | 0.06 | -675.04 | **-671.77** | 3.27 | 0.06 | -746.99 | **-743.64** | 3.22 | 0.06 | -627.10 | **-623.80** | 3.19 | 0.06 | -467.07 | **-463.79** | 3.19 | 0.06 | -398.09 | **-394.82** |
| | ASHRAE Climate Zone 3 | 36" | 0.02 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 0.02 | 3.09 | 0.06 | -680.37 | **-677.20** | | | | | | | | | | | | | | | |
| | | 60" | 0.02 | 3.20 | 0.06 | -680.37 | **-677.09** | 3.29 | 0.06 | -761.59 | **-758.21** | 3.23 | 0.06 | -659.57 | **-656.25** | 3.20 | 0.06 | -515.39 | **-512.11** | 3.19 | 0.06 | -454.67 | **-451.40** |
| | | 72" | 0.02 | 3.19 | 0.06 | -680.37 | **-677.11** | 3.27 | 0.06 | -761.59 | **-758.24** | 3.22 | 0.06 | -659.57 | **-656.27** | 3.19 | 0.06 | -515.39 | **-512.12** | 3.19 | 0.06 | -454.67 | **-451.40** |
| | ASHRAE Climate Zone 4 | 36" | 0.02 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 0.02 | 3.09 | 0.06 | -391.53 | **-388.35** | | | | | | | | | | | | | | | |
| | | 60" | 0.02 | 3.20 | 0.06 | -391.53 | **-388.24** | 3.29 | 0.06 | -435.69 | **-432.31** | 3.23 | 0.06 | -383.77 | **-380.46** | 3.20 | 0.06 | -306.65 | **-303.37** | 3.19 | 0.06 | -273.29 | **-270.02** |
| | | 72" | 0.02 | 3.19 | 0.06 | -391.53 | **-388.26** | 3.27 | 0.06 | -435.69 | **-432.34** | 3.22 | 0.06 | -383.77 | **-380.48** | 3.19 | 0.06 | -306.65 | **-303.38** | 3.19 | 0.06 | -273.29 | **-270.02** |
| | ASHRAE Climate Zone 5 | 36" | 0.02 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 0.02 | 3.09 | 0.06 | -312.64 | **-309.47** | | | | | | | | | | | | | | | |
| | | 60" | 0.02 | 3.20 | 0.06 | -312.64 | **-309.36** | 3.29 | 0.06 | -344.54 | **-341.17** | 3.23 | 0.06 | -308.55 | **-305.23** | 3.20 | 0.06 | -254.45 | **-251.17** | 3.19 | 0.06 | -228.29 | **-225.02** |
| | | 72" | 0.02 | 3.19 | 0.06 | -312.64 | **-309.37** | 3.27 | 0.06 | -344.54 | **-341.19** | 3.22 | 0.06 | -308.55 | **-305.25** | 3.19 | 0.06 | -254.45 | **-251.18** | 3.19 | 0.06 | -228.29 | **-225.02** |
| | ASHRAE Climate Zone 6,7 | 36" | 0.02 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 0.02 | 3.09 | 0.06 | -398.34 | **-395.17** | | | | | | | | | | | | | | | |
| | | 60" | 0.02 | 3.20 | 0.06 | -398.34 | **-395.06** | 3.29 | 0.06 | -430.65 | **-427.27** | 3.23 | 0.06 | -386.28 | **-382.97** | 3.20 | 0.06 | -317.55 | **-314.26** | 3.19 | 0.06 | -282.10 | **-278.82** |
| | | 72" | 0.02 | 3.19 | 0.06 | -398.34 | **-395.07** | 3.27 | 0.06 | -430.65 | **-427.30** | 3.22 | 0.06 | -386.28 | **-382.99** | 3.19 | 0.06 | -317.55 | **-314.27** | 3.19 | 0.06 | -282.10 | **-278.83** |
| | Canada | 36" | 0.08 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 0.07 | | | | | | | | | | | | | | | | | | | |
| | | 60" | 0.08 | | | | | 3.29 | 0.06 | 84.55 | **87.98** | 3.23 | 0.06 | 62.01 | **65.38** | 3.20 | 0.06 | 41.29 | **44.63** | 3.19 | 0.06 | 32.54 | **35.87** |
| | | 72" | 0.08 | | | | | 3.27 | 0.06 | 84.55 | **87.95** | 3.22 | 0.06 | 62.01 | **65.36** | 3.19 | 0.06 | 41.29 | **44.62** | 3.19 | 0.06 | 32.54 | **35.86** |
| | Mexico | 36" | 0.02 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 0.02 | 3.09 | 0.06 | -291.01 | **-287.84** | | | | | | | | | | | | | | | |
| | | 60" | 0.02 | 3.20 | 0.06 | -291.01 | **-287.73** | | | | | | | | | | | | | 3.19 | 0.06 | -194.24 | **-190.96** |
| | | 72" | 0.02 | 3.19 | 0.06 | -291.01 | **-287.74** | | | | | | | | | | | | | 3.19 | 0.06 | -194.24 | **-190.97** |
| Europe | France | 36" | 1.00 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 0.98 | 3.09 | 0.10 | -12.73 | **-8.56** | | | | | | | | | | | | | | | |
| | | 60" | 1.01 | 3.20 | 0.10 | -12.73 | **-8.43** | 3.29 | 0.10 | -12.88 | **-8.49** | 3.23 | 0.10 | -14.81 | **-10.47** | 3.20 | 0.10 | -12.78 | **-8.47** | 3.19 | 0.10 | -13.63 | **-9.33** |
| | | 72" | 0.99 | 3.19 | 0.09 | -12.73 | **-8.46** | 3.27 | 0.09 | -12.88 | **-8.53** | 3.22 | 0.09 | -14.81 | **-10.50** | 3.19 | 0.09 | -12.78 | **-8.50** | 3.19 | 0.09 | -13.63 | **-9.35** |
| | Northern Europe | 36" | 1.02 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.00 | 3.09 | 0.07 | -183.76 | **-179.60** | | | | | | | | | | | | | | | |
| | | 60" | 1.03 | 3.38 | 0.07 | -183.76 | **-179.28** | 3.29 | 0.07 | -205.80 | **-201.41** | 3.23 | 0.07 | -190.62 | **-186.29** | 3.20 | 0.07 | -151.43 | **-147.14** | 3.19 | 0.07 | -138.18 | **-133.90** |
| | | 72" | 1.01 | 3.19 | 0.07 | -183.76 | **-179.50** | 3.27 | 0.07 | -205.80 | **-201.45** | 3.22 | 0.07 | -190.62 | **-186.33** | 3.19 | 0.07 | -151.43 | **-147.17** | 3.19 | 0.07 | -138.18 | **-133.92** |
| | Russia | 36" | 1.08 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.05 | | | | | | | | | | | | | | | | | | | |
| | | 60" | 1.08 | | | | | | | | | | | | | | | | | | | |
| | | 72" | 1.06 | | | | | | | | | | | | | | | | | | | |
| | Scandivania | 36" | 0.99 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 0.96 | 3.09 | 0.18 | -44.25 | **-40.01** | | | | | | | | | | | | | | | |
| | | 60" | 0.99 | 3.20 | 0.18 | -44.25 | **-39.88** | 3.29 | 0.18 | -44.84 | **-40.38** | 3.23 | 0.18 | -42.21 | **-37.81** | 3.20 | 0.18 | -34.51 | **-30.14** | 3.19 | 0.18 | -28.56 | **-24.20** |
| | | 72" | 0.97 | 3.19 | 0.18 | -44.25 | **-39.91** | 3.27 | 0.18 | -44.84 | **-40.42** | 3.22 | 0.18 | -42.21 | **-37.85** | 3.19 | 0.12 | -34.51 | **-30.23** | 3.19 | 0.18 | -28.56 | **-24.22** |
| | Southern Europe | 36" | 1.02 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.00 | 3.09 | 0.07 | -341.51 | **-337.35** | | | | | | | | | | | | | | | |
| | | 60" | 1.03 | 3.20 | 0.07 | -341.51 | **-337.21** | 3.29 | 0.07 | -378.05 | **-373.66** | 3.23 | 0.07 | -331.48 | **-327.15** | 3.20 | 0.07 | -260.72 | **-256.43** | 3.19 | 0.07 | -231.46 | **-227.17** |
| | | 72" | 1.01 | 3.18 | 0.07 | -341.51 | **-337.25** | 3.27 | 0.07 | -378.05 | **-373.71** | 3.21 | 0.07 | -331.48 | **-327.19** | 3.19 | 0.07 | -260.72 | **-256.46** | 3.19 | 0.07 | -231.46 | **-227.19** |
| | United Kingdom | 36" | 0.97 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 0.95 | 3.09 | 0.06 | -188.98 | **-184.88** | | | | | | | | | | | | | | | |
| | | 60" | 0.97 | 3.20 | 0.06 | -188.98 | **-184.75** | 3.29 | 0.06 | -215.69 | **-211.37** | 3.23 | 0.06 | -174.85 | **-170.59** | 3.20 | 0.06 | -154.48 | **-150.25** | 3.19 | 0.06 | -133.37 | **-129.15** |
| | | 72" | 0.95 | 3.19 | 0.06 | -188.98 | **-184.78** | 3.27 | 0.06 | -215.69 | **-211.41** | 3.22 | 0.09 | -174.85 | **-170.59** | 3.19 | 0.06 | -154.48 | **-150.28** | 3.19 | 0.06 | -133.37 | **-129.17** |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

## 9.1 Global warming potential: Asia and South America

| Global Warming Potential ($kg\ CO_2$-eq/$m^2$) | | PS Series | LX 40 | | | | Hilite 40 | | | | 4 Mil Clear | Sentinel 4 Mil Clear | | | | CDA & OSW | Silver AG 50 Low-E | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Transportation to Customer | Manufacturing | End-of-life | Operational Energy | **Net kg $CO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $CO_2$-eq** | Transportation to Customer | Manufacturing | End-of-life | Operational Energy | **Net kg $CO_2$-eq** | Transportation to Customer | Manufacturing | End-of-life | Operational Energy | **Net kg $CO_2$-eq** |
| Asia and Pacific | | | | | | | | | | | | | | | | | | | | |
| Australia | 36" | | | | | | | | | | 2.30 | 4.02 | 0.12 | -96.10 | **-89.66** | 1.36 | 2.73 | 0.06 | -520.37 | **-516.22** |
| | 48" | | | | | | | | | | 2.27 | 3.80 | 0.12 | -96.10 | **-89.91** | 1.33 | 3.07 | 0.06 | -520.37 | **-515.91** |
| | 60" | | | | | | | | | | 2.31 | 3.97 | 0.12 | -96.10 | **-89.70** | 1.36 | 3.36 | 0.07 | -520.37 | **-515.58** |
| | 72" | | | | | | | | | | 2.29 | 4.02 | 0.12 | -96.10 | **-89.68** | 1.34 | | | | |
| China, Mid-East Coast | 36" | | | | | | | | | | 1.88 | | | | | 1.11 | | | | |
| | 48" | | | | | | | | | | 1.86 | | | | | 1.09 | | | | |
| | 60" | | | | | | | | | | 1.89 | | | | | 1.12 | | | | |
| | 72" | | | | | | | | | | 1.87 | | | | | 1.10 | | | | |
| North-East Asia | 36" | | | | | | | | | | 1.88 | | | | | 1.11 | 2.73 | 0.06 | -926.98 | **-923.08** |
| | 48" | | | | | | | | | | 1.86 | | | | | 1.09 | 3.07 | 0.06 | -926.98 | **-922.77** |
| | 60" | | | | | | | | | | 1.89 | | | | | 1.12 | 3.36 | 0.07 | -926.98 | **-922.43** |
| | 72" | | | | | | | | | | 1.87 | | | | | 1.10 | | | | |
| China, South-East | 36" | | | | | | | | | | | | | | | 1.11 | | | | |
| | 48" | | | | | | | | | | | | | | | 1.09 | | | | |
| | 60" | | | | | | | | | | | | | | | 1.12 | | | | |
| | 72" | | | | | | | | | | | | | | | 1.10 | | | | |
| India | 36" | | | | | | | | | | | | | | | | | | | |
| | 48" | | | | | | | | | | | | | | | | | | | |
| | 60" | | | | | | | | | | | | | | | | | | | |
| | 72" | | | | | | | | | | | | | | | | | | | |
| Japan | 36" | | | | | | | | | | | | | | | 0.97 | | | | |
| | 48" | | | | | | | | | | | | | | | 0.96 | | | | |
| | 60" | | | | | | | | | | | | | | | 0.98 | | | | |
| | 72" | | | | | | | | | | | | | | | 0.96 | | | | |
| Malaysia | 36" | | | | | | | | | | | | | | | 1.49 | | | | |
| | 48" | | | | | | | | | | | | | | | 1.46 | | | | |
| | 60" | | | | | | | | | | | | | | | 1.50 | | | | |
| | 72" | | | | | | | | | | | | | | | 1.46 | | | | |
| Middle East | 36" | | | | | | | | | | | | | | | 1.46 | 2.73 | 0.06 | -923.04 | **-918.78** |
| | 48" | | | | | | | | | | | | | | | 1.43 | 3.07 | 0.06 | -923.04 | **-918.49** |
| | 60" | | | | | | | | | | | | | | | 1.46 | 3.36 | 0.07 | -923.04 | **-918.14** |
| | 72" | | | | | | | | | | | | | | | 1.44 | | | | |
| Turkey | 36" | | | | | | | | | | | | | | | 1.24 | | | | |
| | 48" | | | | | | | | | | | | | | | 1.21 | | | | |
| | 60" | | | | | | | | | | | | | | | 1.24 | | | | |
| | 72" | | | | | | | | | | | | | | | 1.22 | | | | |
| South America | | | | | | | | | | | | | | | | | | | | |
| Argentina | 36" | | | | | | | | | | | | | | | 1.05 | | | | |
| | 48" | | | | | | | | | | | | | | | 1.03 | | | | |
| | 60" | | | | | | | | | | | | | | | 1.05 | | | | |
| | 72" | | | | | | | | | | | | | | | 1.03 | | | | |
| Brazil | 36" | | | | | | | | | | | | | | | 0.99 | | | | |
| | 48" | | | | | | | | | | | | | | | 0.97 | | | | |
| | 60" | | 6.43 | 0.09 | -292.09 | **-284.24** | | | | | | | | | | 0.99 | | | | |
| | 72" | | | | | | | | | | | | | | | 0.97 | | | | |
| Venezuela | 36" | | | | | | | | | | | | | | | 0.62 | | | | |
| | 48" | | | | | | | | | | | | | | | 0.61 | | | | |
| | 60" | | | | | | | | | | | | | | | 0.62 | | | | |
| | 72" | | | | | | | | | | | | | | | 0.61 | | | | |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

## 9.1 Global warming potential: Asia and South America (cont.)

| Global Warming Potential (kg $CO_2$-eq/$m^2$) | | | CDA & OSW | TrueVue 5 | | | | TrueVue 15 | | | | TrueVue 30 | | | | TrueVue 40 | | | | Sentinel Silver 20 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Transportation to Customer | Manufacturing | End-of-life | Operational Energy | **Net kg $CO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $CO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $CO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $CO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $CO_2$-eq** |
| Asia and Pacific | Australia | 36" | 1.36 | | | | | | | | | | | | | | | | | 3.21 | 0.06 | -503.53 | **-498.90** |
| | | 48" | 1.33 | | | | | | | | | | | | | | | | | 3.12 | 0.06 | -503.53 | **-499.02** |
| | | 60" | 1.36 | | | | | | | | | | | | | | | | | 3.22 | 0.06 | -503.53 | **-498.88** |
| | | 72" | 1.34 | | | | | | | | | | | | | | | | | 3.21 | 0.06 | -503.53 | **-498.92** |
| | China, Mid-East Coast | 36" | 1.11 | | | | | | | | | | | | | | | | | 3.21 | 0.06 | -823.29 | **-818.91** |
| | | 48" | 1.09 | | | | | | | | | | | | | | | | | 3.12 | 0.06 | -823.29 | **-819.02** |
| | | 60" | 1.12 | | | | | | | | | | | | | | | | | 3.22 | 0.06 | -823.29 | **-818.89** |
| | | 72" | 1.10 | | | | | | | | | | | | | | | | | 3.21 | 0.06 | -823.29 | **-818.93** |
| | North-East Asia | 36" | 1.11 | 3.31 | 0.06 | -1360.26 | **-1355.77** | 3.28 | 0.06 | -1319.24 | **-1314.79** | 3.24 | 0.06 | -975.58 | **-971.17** | 3.22 | 0.06 | -790.96 | **-786.57** | | | | |
| | | 48" | 1.09 | 3.24 | 0.06 | -1360.26 | **-1355.87** | 3.24 | 0.06 | -1319.24 | **-1314.85** | 3.16 | 0.06 | -975.58 | **-971.27** | 3.15 | 0.06 | -790.96 | **-786.66** | | | | |
| | | 60" | 1.12 | 3.32 | 0.06 | -1360.26 | **-1355.76** | 3.32 | 0.06 | -1319.24 | **-1314.74** | 3.26 | 0.06 | -975.58 | **-971.14** | 3.24 | 0.06 | -790.96 | **-786.54** | | | | |
| | | 72" | 1.10 | 3.28 | 0.06 | -1360.26 | **-1355.82** | 3.28 | 0.06 | -1319.24 | **-1314.80** | 3.23 | 0.06 | -975.58 | **-971.19** | 3.22 | 0.06 | -790.96 | **-786.58** | | | | |
| | China, South-East | 36" | 1.11 | | | | | | | | | | | | | | | | | 3.21 | 0.06 | -1161.19 | **-1156.80** |
| | | 48" | 1.09 | | | | | | | | | | | | | | | | | 3.12 | 0.06 | -1161.19 | **-1156.92** |
| | | 60" | 1.12 | | | | | | | | | | | | | | | | | 3.22 | 0.06 | -1161.19 | **-1156.79** |
| | | 72" | 1.10 | | | | | | | | | | | | | | | | | 3.21 | 0.06 | -1161.19 | **-1156.82** |
| | India | 36" | | | | | | | | | | | | | | | | | | | | | |
| | | 48" | | | | | | | | | | | | | | | | | | | | | |
| | | 60" | | | | | | | | | | | | | | | | | | | | | |
| | | 72" | | | | | | | | | | | | | | | | | | | | | |
| | Japan | 36" | 0.97 | | | | | | | | | | | | | | | | | 3.21 | 0.06 | -268.85 | **-264.60** |
| | | 48" | 0.96 | | | | | | | | | | | | | | | | | 3.12 | 0.06 | -268.85 | **-264.71** |
| | | 60" | 0.98 | | | | | | | | | | | | | | | | | 3.22 | 0.06 | -268.85 | **-264.59** |
| | | 72" | 0.96 | | | | | | | | | | | | | | | | | 3.21 | 0.06 | -268.85 | **-264.62** |
| | Malaysia | 36" | 1.49 | | | | | | | | | | | | | | | | | 3.21 | 0.06 | -480.26 | **-475.49** |
| | | 48" | 1.46 | | | | | | | | | | | | | | | | | 3.12 | 0.06 | -480.26 | **-475.61** |
| | | 60" | 1.50 | | | | | | | | | | | | | | | | | 3.22 | 0.06 | -480.26 | **-475.47** |
| | | 72" | 1.46 | | | | | | | | | | | | | | | | | 3.26 | 0.06 | -480.26 | **-475.47** |
| | Middle East | 36" | 1.46 | 3.31 | 0.06 | -1466.69 | **-1461.85** | 3.28 | 0.06 | -1417.87 | **-1413.07** | 3.24 | 0.06 | -1009.39 | **-1004.63** | 3.22 | 0.06 | -787.38 | **-782.64** | 3.21 | 0.06 | -784.34 | **-779.61** |
| | | 48" | 1.43 | 3.24 | 0.06 | -1466.69 | **-1461.97** | 3.24 | 0.06 | -1417.87 | **-1413.14** | 3.16 | 0.06 | -1009.39 | **-1004.74** | 3.15 | 0.06 | -787.38 | **-782.74** | 3.12 | 0.06 | -784.34 | **-779.73** |
| | | 60" | 1.46 | 3.32 | 0.06 | -1466.69 | **-1461.85** | 3.32 | 0.06 | -1417.87 | **-1413.03** | 3.26 | 0.06 | -1009.39 | **-1004.61** | 3.24 | 0.06 | -787.38 | **-782.61** | 3.22 | 0.06 | -784.34 | **-779.59** |
| | | 72" | 1.44 | 3.28 | 0.06 | -1466.69 | **-1461.91** | 3.28 | 0.06 | -1417.87 | **-1413.09** | 3.23 | 0.06 | -1009.39 | **-1004.66** | 3.22 | 0.06 | -787.38 | **-782.66** | 3.21 | 0.06 | -784.34 | **-779.64** |
| | Turkey | 36" | 1.24 | | | | | | | | | | | | | | | | | 3.21 | 0.06 | -258.83 | **-254.32** |
| | | 48" | 1.21 | | | | | | | | | | | | | | | | | 3.12 | 0.06 | -258.83 | **-254.44** |
| | | 60" | 1.24 | | | | | | | | | | | | | | | | | 3.22 | 0.06 | -258.83 | **-254.30** |
| | | 72" | 1.22 | | | | | | | | | | | | | | | | | 3.21 | 0.06 | -258.83 | **-254.34** |
| South America | Argentina | 36" | 1.05 | | | | | | | | | | | | | | | | | 3.21 | 0.06 | -310.74 | **-306.42** |
| | | 48" | 1.03 | | | | | | | | | | | | | | | | | 3.12 | 0.06 | -310.74 | **-306.53** |
| | | 60" | 1.05 | | | | | | | | | | | | | | | | | 3.23 | 0.06 | -310.74 | **-306.40** |
| | | 72" | 1.03 | | | | | | | | | | | | | | | | | 3.21 | 0.06 | -310.74 | **-306.44** |
| | Brazil | 36" | 0.99 | | | | | | | | | | | | | | | | | 3.21 | 0.06 | -235.96 | **-231.70** |
| | | 48" | 0.97 | | | | | | | | | | | | | | | | | 3.12 | 0.06 | -235.96 | **-231.81** |
| | | 60" | 0.99 | | | | | | | | | | | | | | | | | 3.22 | 0.06 | -235.96 | **-231.68** |
| | | 72" | 0.97 | | | | | | | | | | | | | | | | | 3.21 | 0.06 | -235.96 | **-231.72** |
| | Venezuela | 36" | 0.62 | 3.31 | 0.06 | -254.80 | **-250.80** | 3.28 | 0.06 | -247.55 | **-243.59** | | | | | | | | | 3.21 | 0.06 | -162.39 | **-158.50** |
| | | 48" | 0.61 | 3.24 | 0.06 | -254.80 | **-250.89** | 3.45 | 0.06 | -247.55 | **-243.43** | | | | | | | | | 3.12 | 0.06 | -162.39 | **-158.60** |
| | | 60" | 0.62 | 3.32 | 0.06 | -254.80 | **-250.80** | 3.32 | 0.06 | -247.55 | **-243.55** | | | | | | | | | 3.22 | 0.06 | -162.39 | **-158.49** |
| | | 72" | 0.61 | 3.28 | 0.06 | -254.80 | **-250.84** | 3.28 | 0.06 | -247.55 | **-243.60** | | | | | | | | | 3.21 | 0.06 | -162.39 | **-158.52** |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

## 9.1 Global warming potential: Asia and South America (cont.)

| Global Warming Potential (kg $CO_2$-eq/$m^2$) | | | CDA & OSW | Sentinel Silver 35 | | | | Sentinel Stainless Steel 15 | | | | Sentinel Stainless Steel 25 | | | | Sentinel Stainless Steel 40 | | | | Sentinel Stainless Steel 45 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Transportation to Customer | Manufacturing | End-of-life | Operational Energy | **Net kg $CO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $CO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $CO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $CO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $CO_2$-eq** |
| Asia and Pacific | Australia | 36" | 1.36 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.33 | 3.56 | 0.06 | -417.23 | **-412.28** | | | | | | | | | | | | | | | | |
| | | 60" | 1.36 | 3.20 | 0.06 | -417.23 | **-412.61** | | | | | 3.23 | 0.06 | -402.77 | **-398.12** | 3.20 | 0.06 | -317.12 | **-312.49** | | | | |
| | | 72" | 1.34 | 3.19 | 0.06 | -417.23 | **-412.65** | | | | | 3.22 | 0.06 | -402.77 | **-398.16** | 3.19 | 0.06 | -317.12 | **-312.52** | | | | |
| | China, Mid-East Coast | 36" | 1.11 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.09 | | | | | | | | | | | | | | | | | | | | |
| | | 60" | 1.12 | | | | | 3.29 | 0.06 | -751.56 | **-747.09** | 3.23 | 0.06 | -660.04 | **-655.63** | | | | | | | | |
| | | 72" | 1.10 | | | | | 3.27 | 0.06 | -751.56 | **-747.13** | 3.22 | 0.06 | -660.04 | **-655.67** | | | | | | | | |
| | North-East Asia | 36" | 1.11 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.09 | | | | | | | | | | | | | | | | | | | | |
| | | 60" | 1.12 | | | | | 3.29 | 0.06 | -759.86 | **-755.38** | 3.23 | 0.06 | -666.74 | **-662.32** | | | | | | | | |
| | | 72" | 1.10 | | | | | 3.27 | 0.06 | -759.86 | **-755.43** | 3.22 | 0.06 | -666.74 | **-662.36** | | | | | | | | |
| | China, South-East | 36" | 1.11 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.09 | 3.09 | 0.06 | -909.56 | **-905.31** | | | | | | | | | | | | | | | | |
| | | 60" | 1.12 | 3.20 | 0.06 | -909.56 | **-905.18** | | | | | | | | | | | | | | | | |
| | | 72" | 1.10 | 3.19 | 0.06 | -909.56 | **-905.21** | | | | | | | | | | | | | | | | |
| | India | 36" | | | | | | | | | | | | | | | | | | | | | |
| | | 48" | | | | | | | | | | | | | | | | | | | | | |
| | | 60" | | | | | | | | | | | | | | | | | | | | | |
| | | 72" | | | | | | | | | | | | | | | | | | | | | |
| | Japan | 36" | 0.97 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 0.96 | 3.09 | 0.06 | -220.03 | **-215.92** | | | | | | | | | | | | | | | | |
| | | 60" | 0.98 | 3.20 | 0.06 | -220.03 | **-215.79** | | | | | | | | | | | | | | | | |
| | | 72" | 0.96 | 3.19 | 0.06 | -220.03 | **-215.82** | | | | | | | | | | | | | | | | |
| | Malaysia | 36" | 1.49 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.46 | | | | | | | | | | | | | | | | | | | | |
| | | 60" | 1.50 | | | | | 3.29 | 0.06 | -436.63 | **-431.78** | | | | | | | | | | | | |
| | | 72" | 1.46 | | | | | 3.28 | 0.06 | -436.63 | **-431.83** | | | | | | | | | | | | |
| | Middle East | 36" | 1.46 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.43 | | | | | | | | | | | | | | | | | | | | |
| | | 60" | 1.46 | | | | | | | | | | | | | | | | | | | | |
| | | 72" | 1.44 | | | | | | | | | | | | | | | | | | | | |
| | Turkey | 36" | 1.24 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.21 | 3.09 | 0.06 | -220.62 | **-216.26** | | | | | | | | | | | | | | | | |
| | | 60" | 1.24 | 3.20 | 0.06 | -220.62 | **-216.12** | | | | | | | | | | | | | | | | |
| | | 72" | 1.22 | 3.19 | 0.06 | -220.62 | **-216.16** | | | | | | | | | | | | | | | | |
| South America | Argentina | 36" | 1.05 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.03 | 3.09 | 0.06 | -254.29 | **-250.11** | | | | | | | | | | | | | | | | |
| | | 60" | 1.05 | 3.20 | 0.06 | -254.29 | **-249.97** | 3.29 | 0.06 | -283.74 | **-279.33** | | | | | | | | | 3.19 | 0.06 | -167.37 | **-163.06** |
| | | 72" | 1.03 | 3.19 | 0.06 | -254.29 | **-250.01** | 3.27 | 0.06 | -283.74 | **-279.37** | | | | | | | | | 3.19 | 0.06 | -167.37 | **-163.08** |
| | Brazil | 36" | 0.99 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 0.97 | | | | | | | | | | | | | | | | | | | | |
| | | 60" | 0.99 | | | | | | | | | | | | | | | | | | | | |
| | | 72" | 0.97 | | | | | | | | | | | | | | | | | | | | |
| | Venezuela | 36" | 0.62 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 0.61 | | | | | | | | | | | | | | | | | | | | |
| | | 60" | 0.62 | | | | | | | | | | | | | | | | | | | | |
| | | 72" | 0.61 | | | | | | | | | | | | | | | | | | | | |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

## 9.2 Ozone layer depletion potential: North America and Europe

| Ozone Layer Depletion (kg CFC-11 eq/m²) | | | PS Series | LX 40 | | | | Hilite 40 | | | | 4 Mil Clear | Sentinel 4 Mil Clear | | | | CDA & OSW | Silver AG 50 Low-E | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Transportation to Customer | Manufacturing | End-of-Life | Operational Energy | Net CFC-11 eq | Manufacturing | End-of-Life | Operational Energy | Net CFC-11 eq | Transportation to Customer | Manufacturing | End-of-Life | Operational Energy | Net CFC-11 eq | Transportation to Customer | Manufacturing | End-of-Life | Operational Energy | Net CFC-11 eq |
| North America | ASHRAE Climate Zone 1,2 | 36" | | | | | | | | | | 3.88E-09 | 3.05E-07 | 4.47E-10 | -4.16E-07 | **-1.08E-07** | 2.31E-09 | 1.81E-07 | 2.40E-10 | -7.44E-06 | **-7.26E-06** |
| | | 48" | 3.03E-09 | | | | | 2.94E-07 | 3.41E-10 | -7.03E-06 | **-6.73E-06** | 3.86E-09 | 2.94E-07 | 4.44E-10 | -4.16E-07 | **-1.19E-07** | 2.24E-09 | 2.13E-07 | 2.38E-10 | -7.44E-06 | **-7.23E-06** |
| | | 60" | 3.12E-09 | | | | | 2.92E-07 | 3.40E-10 | -7.03E-06 | **-6.73E-06** | 3.90E-09 | 3.06E-07 | 4.43E-10 | -4.16E-07 | **-1.06E-07** | 2.30E-09 | 2.40E-07 | 2.73E-10 | -7.44E-06 | **-7.20E-06** |
| | | 72" | | | | | | | | | | 3.86E-09 | 3.04E-07 | 4.42E-10 | -4.16E-07 | **-1.08E-07** | 2.28E-09 | | | | |
| | ASHRAE Climate Zone 3 | 36" | | | | | | | | | | 3.88E-09 | 3.05E-07 | 4.47E-10 | -6.30E-09 | **3.03E-07** | 2.31E-09 | 1.81E-07 | 2.40E-10 | 3.06E-07 | **4.90E-07** |
| | | 48" | 3.03E-09 | | | | | 2.94E-07 | 3.41E-10 | 1.66E-06 | **1.96E-06** | 3.86E-09 | 2.94E-07 | 4.44E-10 | -6.30E-09 | **2.92E-07** | 2.24E-09 | 2.13E-07 | 2.38E-10 | 3.06E-07 | **5.21E-07** |
| | | 60" | 3.12E-09 | | | | | 2.92E-07 | 3.40E-10 | 1.66E-06 | **1.96E-06** | 3.90E-09 | 3.06E-07 | 4.43E-10 | -6.30E-09 | **3.04E-07** | 2.30E-09 | 2.40E-07 | 2.73E-10 | 3.06E-07 | **5.48E-07** |
| | | 72" | | | | | | | | | | 3.86E-09 | 3.04E-07 | 4.42E-10 | -6.30E-09 | **3.02E-07** | 2.28E-09 | | | | |
| | ASHRAE Climate Zone 4 | 36" | | | | | | | | | | 3.88E-09 | 3.05E-07 | 4.47E-10 | 4.15E-06 | **4.45E-06** | 2.31E-09 | 1.81E-07 | 2.40E-10 | 1.64E-05 | **1.66E-05** |
| | | 48" | 3.03E-09 | | | | | 2.94E-07 | 3.41E-10 | 2.31E-05 | **2.34E-05** | 3.86E-09 | 2.94E-07 | 4.44E-10 | 4.15E-06 | **4.44E-06** | 2.24E-09 | 2.13E-07 | 2.38E-10 | 1.64E-05 | **1.66E-05** |
| | | 60" | 3.12E-09 | | | | | 2.92E-07 | 3.40E-10 | 2.31E-05 | **2.34E-05** | 3.90E-09 | 3.06E-07 | 4.43E-10 | 4.15E-06 | **4.46E-06** | 2.30E-09 | 2.40E-07 | 2.73E-10 | 1.64E-05 | **1.66E-05** |
| | | 72" | | | | | | | | | | 3.86E-09 | 3.04E-07 | 4.42E-10 | 4.15E-06 | **4.45E-06** | 2.28E-09 | | | | |
| | ASHRAE Climate Zone 5 | 36" | | | | | | | | | | 3.88E-09 | 3.05E-07 | 4.47E-10 | 4.53E-06 | **4.83E-06** | 2.31E-09 | 1.81E-07 | 2.40E-10 | 2.04E-05 | **2.06E-05** |
| | | 48" | 3.03E-09 | | | | | 2.94E-07 | 3.41E-10 | 3.18E-05 | **3.21E-05** | 3.86E-09 | 2.94E-07 | 4.44E-10 | 4.53E-06 | **4.82E-06** | 2.24E-09 | 2.13E-07 | 2.38E-10 | 2.04E-05 | **2.06E-05** |
| | | 60" | 3.12E-09 | | | | | 2.92E-07 | 3.40E-10 | 3.18E-05 | **3.21E-05** | 3.90E-09 | 3.06E-07 | 4.43E-10 | 4.53E-06 | **4.84E-06** | 2.30E-09 | 2.40E-07 | 2.73E-10 | 2.04E-05 | **2.06E-05** |
| | | 72" | | | | | | | | | | 3.86E-09 | 3.04E-07 | 4.42E-10 | 4.53E-06 | **4.83E-06** | 2.28E-09 | | | | |
| | ASHRAE Climate Zone 6,7 | 36" | | | | | | | | | | 3.88E-09 | 3.05E-07 | 4.47E-10 | 4.90E-06 | **5.21E-06** | 2.31E-09 | 1.81E-07 | 2.40E-10 | 2.08E-05 | **2.10E-05** |
| | | 48" | 3.03E-09 | | | | | 2.94E-07 | 3.41E-10 | 3.25E-05 | **3.28E-05** | 3.86E-09 | 2.94E-07 | 4.44E-10 | 4.90E-06 | **5.20E-06** | 2.24E-09 | 2.13E-07 | 2.38E-10 | 2.08E-05 | **2.10E-05** |
| | | 60" | 3.12E-09 | | | | | 2.92E-07 | 3.40E-10 | 3.25E-05 | **3.28E-05** | 3.90E-09 | 3.07E-07 | 4.43E-10 | 4.90E-06 | **5.21E-06** | 2.30E-09 | 2.40E-07 | 2.73E-10 | 2.08E-05 | **2.10E-05** |
| | | 72" | | | | | | | | | | 3.86E-09 | 3.04E-07 | 4.42E-10 | 4.90E-06 | **5.21E-06** | 2.28E-09 | | | | |
| | Canada | 36" | | | | | | | | | | 1.32E-08 | | | | | 7.82E-09 | 1.81E-07 | 2.40E-10 | -1.95E-06 | **-1.76E-06** |
| | | 48" | 1.04E-08 | | | | | 2.94E-07 | 3.41E-10 | 1.74E-05 | **1.77E-05** | 1.31E-08 | | | | | 7.64E-09 | 2.13E-07 | 2.38E-10 | -1.95E-06 | **-1.73E-06** |
| | | 60" | 1.05E-08 | | | | | 2.92E-07 | 3.40E-10 | 1.74E-05 | **1.77E-05** | 1.33E-08 | | | | | 7.84E-09 | 2.40E-07 | 2.73E-10 | -1.95E-06 | **-1.70E-06** |
| | | 72" | | | | | | | | | | 1.31E-08 | | | | | 7.71E-09 | | | | |
| | Mexico | 36" | | | | | | | | | | 3.73E-09 | 3.05E-07 | 4.47E-10 | -7.35E-06 | **-7.04E-06** | 2.20E-09 | 1.81E-07 | 2.40E-10 | -3.94E-05 | **-3.92E-05** |
| | | 48" | | | | | | | | | | 3.70E-09 | 2.94E-07 | 4.44E-10 | -7.35E-06 | **-7.05E-06** | 2.16E-09 | 2.13E-07 | 2.38E-10 | -3.94E-05 | **-3.92E-05** |
| | | 60" | | | | | | | | | | 3.75E-09 | 3.06E-07 | 4.43E-10 | -7.35E-06 | **-7.04E-06** | 2.24E-09 | 2.40E-07 | 2.73E-10 | -3.94E-05 | **-3.91E-05** |
| | | 72" | | | | | | | | | | 3.73E-09 | 3.04E-07 | 4.42E-10 | -7.35E-06 | **-7.04E-06** | 2.18E-09 | | | | |
| Europe | France | 36" | | | | | | | | | | 1.89E-07 | 3.05E-07 | 3.77E-10 | 1.31E-06 | **1.81E-06** | 1.11E-07 | 6.09E-08 | 2.17E-10 | 6.60E-06 | **6.77E-06** |
| | | 48" | | | | | | | | | | 1.86E-07 | 2.94E-07 | 3.74E-10 | 1.31E-06 | **1.80E-06** | 1.09E-07 | 2.13E-07 | 2.14E-10 | 6.60E-06 | **6.92E-06** |
| | | 60" | | | | | | | | | | 1.89E-07 | 3.06E-07 | 3.76E-10 | 1.31E-06 | **1.81E-06** | 1.12E-07 | 2.40E-07 | 2.44E-10 | 6.60E-06 | **6.95E-06** |
| | | 72" | | | | | | | | | | 1.88E-07 | 3.04E-07 | 3.74E-10 | 1.31E-06 | **1.81E-06** | 1.10E-07 | | | | |
| | Northern Europe | 36" | | | | | | | | | | 1.92E-07 | 3.05E-07 | 1.93E-10 | 2.30E-06 | **2.79E-06** | 1.13E-07 | 1.81E-07 | 1.62E-10 | -8.47E-07 | **-5.52E-07** |
| | | 48" | 1.50E-07 | | | | | | | | | 1.89E-07 | 2.94E-07 | 1.87E-10 | 2.30E-06 | **2.78E-06** | 1.11E-07 | 2.13E-07 | 1.56E-10 | -8.47E-07 | **-5.22E-07** |
| | | 60" | 1.53E-07 | 2.92E-07 | 1.79E-10 | 1.49E-05 | **1.54E-05** | | | | | 1.92E-07 | 3.06E-07 | 1.95E-10 | 2.30E-06 | **2.80E-06** | 1.14E-07 | 2.40E-07 | 1.69E-10 | -8.47E-07 | **-4.93E-07** |
| | | 72" | | | | | | | | | | 1.91E-07 | 3.04E-07 | 1.91E-10 | 2.30E-06 | **2.79E-06** | 1.12E-07 | | | | |
| | Russia | 36" | | | | | | | | | | | | | | | 1.19E-07 | | | | |
| | | 48" | | | | | | | | | | | | | | | 1.17E-07 | | | | |
| | | 60" | | | | | | | | | | | | | | | 1.20E-07 | | | | |
| | | 72" | | | | | | | | | | | | | | | 1.18E-07 | | | | |
| | Scandivania | 36" | | | | | | | | | | 1.85E-07 | 3.05E-07 | 4.68E-10 | 1.65E-06 | **2.14E-06** | 1.10E-07 | 1.81E-07 | 2.91E-10 | -5.62E-06 | **-5.32E-06** |
| | | 48" | 1.45E-07 | | | | | | | | | 1.83E-07 | 2.94E-07 | 4.62E-10 | 1.65E-06 | **2.12E-06** | 1.07E-07 | 2.13E-07 | 2.85E-10 | -5.62E-06 | **-5.30E-06** |
| | | 60" | 1.48E-07 | 2.92E-07 | 3.81E-10 | 1.50E-05 | **1.55E-05** | | | | | 1.86E-07 | 3.06E-07 | 4.69E-10 | 1.65E-06 | **2.14E-06** | 1.10E-07 | 2.40E-07 | 3.23E-10 | -5.62E-06 | **-5.27E-06** |
| | | 72" | | | | | | | | | | 1.84E-07 | 3.04E-07 | 4.65E-10 | 1.65E-06 | **2.13E-06** | 1.08E-07 | | | | |
| | Southern Europe | 36" | | | | | | | | | | 1.92E-07 | 3.05E-07 | 1.93E-10 | -3.27E-06 | **-2.78E-06** | 1.13E-07 | | | | |
| | | 48" | | | | | | | | | | 1.89E-07 | 2.94E-07 | 1.87E-10 | -3.27E-06 | **-2.79E-06** | 1.11E-07 | | | | |
| | | 60" | | | | | | | | | | 1.92E-07 | 3.06E-07 | 1.95E-10 | -3.27E-06 | **-2.77E-06** | 1.14E-07 | | | | |
| | | 72" | | | | | | | | | | 1.91E-07 | 3.04E-07 | 1.91E-10 | -3.27E-06 | **-2.78E-06** | 1.12E-07 | | | | |
| | United Kingdom | 36" | | | | | | | | | | 1.81E-07 | 3.05E-07 | 4.56E-10 | 3.23E-06 | **3.71E-06** | 1.07E-07 | 1.81E-07 | 2.40E-10 | 2.65E-06 | **2.94E-06** |
| | | 48" | 1.42E-07 | | | | | | | | | 1.79E-07 | 2.94E-07 | 4.54E-10 | 3.23E-06 | **3.70E-06** | 1.05E-07 | 2.13E-07 | 2.38E-10 | 2.65E-06 | **2.97E-06** |
| | | 60" | 1.45E-07 | 2.93E-07 | 3.45E-10 | 1.15E-05 | **1.20E-05** | | | | | 1.82E-07 | 3.06E-07 | 4.53E-10 | 3.23E-06 | **3.72E-06** | 1.08E-07 | 2.40E-07 | 3.65E-10 | 2.65E-06 | **3.00E-06** |
| | | 72" | | | | | | | | | | 1.80E-07 | 3.04E-07 | 4.52E-10 | 3.23E-06 | **3.71E-06** | 1.06E-07 | | | | |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

## 9.2 Ozone layer depletion potential: North America and Europe (cont.)

| Ozone Layer Depletion (kg CFC-11 eq/m²) | | CDA & OSW | Sentinel Silver 35 | | | | Sentinel Stainless Steel 15 | | | | Sentinel Stainless Steel 25 | | | | Sentinel Stainless Steel 40 | | | | Sentinel Stainless Steel 45 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Transportation to Customer | Manufacturing | End-of-Life | Operational Energy | **Net CFC-11 eq** | Manufacturing | End-of-Life | Operational Energy | **Net CFC-11 eq** | Manufacturing | End-of-Life | Operational Energy | **Net CFC-11 eq** | Manufacturing | End-of-Life | Operational Energy | **Net CFC-11 eq** | Manufacturing | End-of-Life | Operational Energy | **Net CFC-11 eq** |
| North America | ASHRAE Climate Zone 1,2 | 36" | 2.31E-09 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 2.24E-09 | 2.24E-07 | 2.38E-10 | -3.84E-06 | **-3.61E-06** | | | | | | | | | | | | | | | |
| | | 60" | 2.30E-09 | 2.34E-07 | 2.36E-10 | -3.84E-06 | **-3.60E-06** | 2.35E-07 | 2.36E-10 | -3.98E-06 | **-3.74E-06** | 2.35E-07 | 2.36E-10 | -3.64E-06 | **-3.41E-06** | 2.34E-07 | 2.36E-10 | -2.70E-06 | **-2.46E-06** | 2.33E-07 | 2.36E-10 | -2.32E-06 | **-2.08E-06** |
| | | 72" | 2.28E-09 | 2.31E-07 | 2.36E-10 | -3.84E-06 | **-3.61E-06** | 2.32E-07 | 2.36E-10 | -3.98E-06 | **-3.75E-06** | 2.31E-07 | 2.36E-10 | -3.64E-06 | **-3.41E-06** | 2.31E-07 | 2.36E-10 | -2.70E-06 | **-2.47E-06** | 2.31E-07 | 2.36E-10 | -2.32E-06 | **-2.08E-06** |
| | ASHRAE Climate Zone 3 | 36" | 2.31E-09 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 2.24E-09 | 2.24E-07 | 2.38E-10 | 2.59E-06 | **2.81E-06** | | | | | | | | | | | | | | | |
| | | 60" | 2.30E-09 | 2.34E-07 | 2.36E-10 | 2.59E-06 | **2.82E-06** | 2.35E-07 | 2.36E-10 | 3.69E-06 | **3.93E-06** | 2.35E-07 | 2.36E-10 | 2.24E-06 | **2.48E-06** | 2.34E-07 | 2.36E-10 | 1.53E-06 | **1.76E-06** | 2.33E-07 | 2.36E-10 | 8.71E-07 | **1.11E-06** |
| | | 72" | 2.28E-09 | 2.31E-07 | 2.36E-10 | 2.59E-06 | **2.82E-06** | 2.32E-07 | 2.36E-10 | 3.69E-06 | **3.93E-06** | 2.31E-07 | 2.36E-10 | 2.24E-06 | **2.48E-06** | 2.31E-07 | 2.36E-10 | 1.53E-06 | **1.76E-06** | 2.31E-07 | 2.36E-10 | 8.71E-07 | **1.10E-06** |
| | ASHRAE Climate Zone 4 | 36" | 2.31E-09 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 2.24E-09 | 2.24E-07 | 2.38E-10 | 2.33E-05 | **2.35E-05** | | | | | | | | | | | | | | | |
| | | 60" | 2.30E-09 | 2.34E-07 | 2.36E-10 | 2.33E-05 | **2.35E-05** | 2.35E-07 | 2.36E-10 | 2.68E-05 | **2.71E-05** | 2.35E-07 | 2.36E-10 | 2.16E-05 | **2.18E-05** | 2.34E-07 | 2.36E-10 | 1.57E-05 | **1.59E-05** | 2.33E-07 | 2.36E-10 | 1.29E-05 | **1.31E-05** |
| | | 72" | 2.28E-09 | 2.31E-07 | 2.36E-10 | 2.33E-05 | **2.35E-05** | 2.32E-07 | 2.36E-10 | 2.68E-05 | **2.71E-05** | 2.31E-07 | 2.36E-10 | 2.16E-05 | **2.18E-05** | 2.31E-07 | 2.36E-10 | 1.57E-05 | **1.59E-05** | 2.31E-07 | 2.36E-10 | 1.29E-05 | **1.31E-05** |
| | ASHRAE Climate Zone 5 | 36" | 2.31E-09 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 2.24E-09 | 2.24E-07 | 2.38E-10 | 3.19E-05 | **3.21E-05** | | | | | | | | | | | | | | | |
| | | 60" | 2.30E-09 | 2.34E-07 | 2.36E-10 | 3.19E-05 | **3.21E-05** | 2.35E-07 | 2.36E-10 | 3.67E-05 | **3.69E-05** | 2.35E-07 | 2.36E-10 | 2.95E-05 | **2.97E-05** | 2.34E-07 | 2.36E-10 | 2.11E-05 | **2.13E-05** | 2.33E-07 | 2.36E-10 | 1.75E-05 | **1.78E-05** |
| | | 72" | 2.28E-09 | 2.31E-07 | 2.36E-10 | 3.19E-05 | **3.21E-05** | 2.32E-07 | 2.36E-10 | 3.67E-05 | **3.69E-05** | 2.31E-07 | 2.36E-10 | 2.95E-05 | **2.97E-05** | 2.31E-07 | 2.36E-10 | 2.11E-05 | **2.13E-05** | 2.31E-07 | 2.36E-10 | 1.75E-05 | **1.78E-05** |
| | ASHRAE Climate Zone 6,7 | 36" | 2.31E-09 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 2.24E-09 | 2.24E-07 | 2.38E-10 | 3.20E-05 | **3.22E-05** | | | | | | | | | | | | | | | |
| | | 60" | 2.30E-09 | 2.34E-07 | 2.36E-10 | 3.20E-05 | **3.22E-05** | 2.35E-07 | 2.36E-10 | 3.89E-05 | **3.91E-05** | 2.35E-07 | 2.36E-10 | 3.08E-05 | **3.11E-05** | 2.34E-07 | 2.36E-10 | 2.15E-05 | **2.17E-05** | 2.33E-07 | 2.36E-10 | 1.84E-05 | **1.86E-05** |
| | | 72" | 2.28E-09 | 2.31E-07 | 2.36E-10 | 3.20E-05 | **3.22E-05** | 2.32E-07 | 2.36E-10 | 3.89E-05 | **3.91E-05** | 2.31E-07 | 2.36E-10 | 3.08E-05 | **3.11E-05** | 2.31E-07 | 2.36E-10 | 2.15E-05 | **2.17E-05** | 2.31E-07 | 2.36E-10 | 1.84E-05 | **1.86E-05** |
| | Canada | 36" | 7.82E-09 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 7.64E-09 | | | | | | | | | | | | | | | | | | | |
| | | 60" | 7.84E-09 | | | | | 2.35E-07 | 2.36E-10 | 2.36E-05 | **2.39E-05** | 2.35E-07 | 2.36E-10 | 1.78E-05 | **1.80E-05** | 2.34E-07 | 2.36E-10 | 1.22E-05 | **1.25E-05** | 2.33E-07 | 2.36E-10 | 9.87E-06 | **1.01E-05** |
| | | 72" | 7.71E-09 | | | | | 2.32E-07 | 2.36E-10 | 2.36E-05 | **2.39E-05** | 2.31E-07 | 2.36E-10 | 1.78E-05 | **1.80E-05** | 2.31E-07 | 2.36E-10 | 1.22E-05 | **1.25E-05** | 2.31E-07 | 2.36E-10 | 9.87E-06 | **1.01E-05** |
| | Mexico | 36" | 2.20E-09 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 2.16E-09 | 2.24E-07 | 2.38E-10 | -3.16E-05 | **-3.14E-05** | | | | | | | | | | | | | | | |
| | | 60" | 2.24E-09 | 2.34E-07 | 2.36E-10 | -3.16E-05 | **-3.14E-05** | | | | | | | | | | | | | 2.33E-07 | 2.36E-10 | -2.12E-05 | **-2.10E-05** |
| | | 72" | 2.18E-09 | 2.31E-07 | 2.36E-10 | -3.16E-05 | **-3.14E-05** | | | | | | | | | | | | | 2.31E-07 | 2.36E-10 | -2.12E-05 | **-2.10E-05** |
| Europe | France | 36" | 1.11E-07 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.09E-07 | 2.24E-07 | 2.14E-10 | 9.68E-06 | **1.00E-05** | | | | | | | | | | | | | | | |
| | | 60" | 1.12E-07 | 2.34E-07 | 2.16E-10 | 9.68E-06 | **1.00E-05** | 2.35E-07 | 2.16E-10 | 1.12E-05 | **1.15E-05** | 2.35E-07 | 2.16E-10 | 8.78E-06 | **9.13E-06** | 2.34E-07 | 2.16E-10 | 6.56E-06 | **6.91E-06** | 2.33E-07 | 2.16E-10 | 5.20E-06 | **5.55E-06** |
| | | 72" | 1.10E-07 | 2.31E-07 | 2.14E-10 | 9.68E-06 | **1.00E-05** | 2.32E-07 | 2.14E-10 | 1.12E-05 | **1.15E-05** | 2.31E-07 | 2.14E-10 | 8.78E-06 | **9.12E-06** | 2.31E-07 | 2.14E-10 | 6.56E-06 | **6.90E-06** | 2.31E-07 | 2.14E-10 | 5.20E-06 | **5.54E-06** |
| | Northern Europe | 36" | 1.13E-07 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.11E-07 | 2.24E-07 | 1.56E-10 | 1.71E-05 | **1.74E-05** | | | | | | | | | | | | | | | |
| | | 60" | 1.14E-07 | 2.48E-07 | 1.69E-10 | 1.71E-05 | **1.74E-05** | 2.35E-07 | 1.63E-10 | 1.95E-05 | **1.98E-05** | 2.35E-07 | 1.63E-10 | 1.40E-05 | **1.44E-05** | 2.34E-07 | 1.63E-10 | 1.07E-05 | **1.10E-05** | 2.33E-07 | 1.63E-10 | 8.36E-06 | **8.71E-06** |
| | | 72" | 1.12E-07 | 2.31E-07 | 1.59E-10 | 1.71E-05 | **1.74E-05** | 2.32E-07 | 1.59E-10 | 1.95E-05 | **1.98E-05** | 2.31E-07 | 1.59E-10 | 1.40E-05 | **1.44E-05** | 2.31E-07 | 1.59E-10 | 1.07E-05 | **1.10E-05** | 2.31E-07 | 1.59E-10 | 8.36E-06 | **8.71E-06** |
| | Russia | 36" | 1.19E-07 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.17E-07 | | | | | | | | | | | | | | | | | | | |
| | | 60" | 1.20E-07 | | | | | | | | | | | | | | | | | | | |
| | | 72" | 1.18E-07 | | | | | | | | | | | | | | | | | | | |
| | Scandivania | 36" | 1.10E-07 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.07E-07 | 2.24E-07 | 2.85E-10 | 1.44E-05 | **1.47E-05** | | | | | | | | | | | | | | | |
| | | 60" | 1.10E-07 | 2.34E-07 | 2.92E-10 | 1.44E-05 | **1.47E-05** | 2.35E-07 | 2.92E-10 | 1.70E-05 | **1.74E-05** | 2.35E-07 | 2.92E-10 | 1.40E-05 | **1.44E-05** | 2.34E-07 | 2.92E-10 | 1.08E-05 | **1.11E-05** | 2.33E-07 | 2.92E-10 | 9.86E-06 | **1.02E-05** |
| | | 72" | 1.08E-07 | 2.31E-07 | 2.88E-10 | 1.44E-05 | **1.47E-05** | 2.32E-07 | 2.88E-10 | 1.70E-05 | **1.74E-05** | 2.31E-07 | 2.88E-10 | 1.40E-05 | **1.44E-05** | 2.31E-07 | 2.73E-10 | 1.08E-05 | **1.11E-05** | 2.31E-07 | 2.88E-10 | 9.86E-06 | **1.02E-05** |
| | Southern Europe | 36" | 1.13E-07 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.11E-07 | 2.24E-07 | 1.56E-10 | -9.96E-06 | **-9.62E-06** | | | | | | | | | | | | | | | |
| | | 60" | 1.14E-07 | 2.34E-07 | 1.63E-10 | -9.96E-06 | **-9.61E-06** | 2.35E-07 | 1.63E-10 | -1.01E-05 | **-9.76E-06** | 2.35E-07 | 1.63E-10 | -9.85E-06 | **-9.50E-06** | 2.34E-07 | 1.63E-10 | -7.99E-06 | **-7.64E-06** | 2.33E-07 | 1.63E-10 | -7.51E-06 | **-7.16E-06** |
| | | 72" | 1.12E-07 | 2.30E-07 | 1.59E-10 | -9.96E-06 | **-9.61E-06** | 2.32E-07 | 1.59E-10 | -1.01E-05 | **-9.76E-06** | 2.31E-07 | 1.59E-10 | -9.85E-06 | **-9.51E-06** | 2.31E-07 | 1.59E-10 | -7.99E-06 | **-7.64E-06** | 2.31E-07 | 1.59E-10 | -7.51E-06 | **-7.17E-06** |
| | United Kingdom | 36" | 1.07E-07 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.05E-07 | 2.24E-07 | 2.38E-10 | 1.20E-05 | **1.23E-05** | | | | | | | | | | | | | | | |
| | | 60" | 1.08E-07 | 2.34E-07 | 2.37E-10 | 1.20E-05 | **1.24E-05** | 2.35E-07 | 2.37E-10 | 1.30E-05 | **1.34E-05** | 2.35E-07 | 2.37E-10 | 1.34E-05 | **1.38E-05** | 2.34E-07 | 2.37E-10 | 6.99E-06 | **7.33E-06** | 2.33E-07 | 2.37E-10 | 6.66E-06 | **7.00E-06** |
| | | 72" | 1.06E-07 | 2.31E-07 | 2.36E-10 | 1.20E-05 | **1.23E-05** | 2.32E-07 | 2.36E-10 | 1.30E-05 | **1.34E-05** | 2.31E-07 | 3.23E-10 | 1.34E-05 | **1.38E-05** | 2.31E-07 | 2.36E-10 | 6.99E-06 | **7.32E-06** | 2.31E-07 | 2.36E-10 | 6.66E-06 | **7.00E-06** |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

## 9.2 Ozone layer depletion potential: North America and Europe (cont.)

| Ozone Layer Depletion (kg CFC-11 eq/m²) | | | CDA & OSW | TrueVue 5 | | | | TrueVue 15 | | | | TrueVue 30 | | | | TrueVue 40 | | | | Sentinel Silver 20 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Transportation to Customer | Manufacturing | End-of-Life | Operational Energy | **Net CFC-11 eq** | Manufacturing | End-of-Life | Operational Energy | **Net CFC-11 eq** | Manufacturing | End-of-Life | Operational Energy | **Net CFC-11 eq** | Manufacturing | End-of-Life | Operational Energy | **Net CFC-11 eq** | Manufacturing | End-of-Life | Operational Energy | **Net CFC-11 eq** |
| North America | ASHRAE Climate Zone 1,2 | 36" | 2.31E-09 | 2.38E-07 | 2.40E-10 | -9.55E-06 | **-9.31E-06** | 2.37E-07 | 2.40E-10 | -9.48E-06 | **-9.24E-06** | 2.36E-07 | 2.40E-10 | -7.02E-06 | **-6.78E-06** | 2.35E-07 | 2.40E-10 | -5.94E-06 | **-5.70E-06** | 2.31E-07 | 2.40E-10 | -4.45E-06 | **-4.21E-06** |
| | | 48" | 2.24E-09 | 2.30E-07 | 2.38E-10 | -9.55E-06 | **-9.32E-06** | 2.31E-07 | 2.38E-10 | -9.48E-06 | **-9.24E-06** | 2.28E-07 | 2.38E-10 | -7.02E-06 | **-6.79E-06** | 2.27E-07 | 2.38E-10 | -5.94E-06 | **-5.71E-06** | 2.24E-07 | 2.38E-10 | -4.45E-06 | **-4.22E-06** |
| | | 60" | 2.30E-09 | 2.39E-07 | 2.36E-10 | -9.55E-06 | **-9.31E-06** | 2.39E-07 | 2.36E-10 | -9.48E-06 | **-9.24E-06** | 2.37E-07 | 2.36E-10 | -7.02E-06 | **-6.78E-06** | 2.36E-07 | 2.36E-10 | -5.94E-06 | **-5.70E-06** | 2.34E-07 | 2.36E-10 | -4.45E-06 | **-4.21E-06** |
| | | 72" | 2.28E-09 | 2.37E-07 | 2.36E-10 | -9.55E-06 | **-9.31E-06** | 2.37E-07 | 2.36E-10 | -9.48E-06 | **-9.24E-06** | 2.35E-07 | 2.36E-10 | -7.02E-06 | **-6.78E-06** | 2.35E-07 | 2.36E-10 | -5.94E-06 | **-5.70E-06** | 2.31E-07 | 2.36E-10 | -4.45E-06 | **-4.21E-06** |
| | ASHRAE Climate Zone 3 | 36" | 2.31E-09 | 2.38E-07 | 2.40E-10 | 4.49E-06 | **4.73E-06** | 2.37E-07 | 2.40E-10 | 3.67E-06 | **3.91E-06** | 2.36E-07 | 2.40E-10 | 1.63E-06 | **1.87E-06** | 2.35E-07 | 2.40E-10 | -9.57E-08 | **1.42E-07** | 2.31E-07 | 2.40E-10 | 5.07E-06 | **5.30E-06** |
| | | 48" | 2.24E-09 | 2.30E-07 | 2.38E-10 | 4.49E-06 | **4.73E-06** | 2.31E-07 | 2.38E-10 | 3.67E-06 | **3.90E-06** | 2.28E-07 | 2.38E-10 | 1.63E-06 | **1.86E-06** | 2.27E-07 | 2.38E-10 | -9.57E-08 | **1.34E-07** | 2.24E-07 | 2.38E-10 | 5.07E-06 | **5.29E-06** |
| | | 60" | 2.30E-09 | 2.39E-07 | 2.36E-10 | 4.49E-06 | **4.74E-06** | 2.39E-07 | 2.36E-10 | 3.67E-06 | **3.91E-06** | 2.37E-07 | 2.36E-10 | 1.63E-06 | **1.87E-06** | 2.36E-07 | 2.36E-10 | -9.57E-08 | **1.43E-07** | 2.34E-07 | 2.36E-10 | 5.07E-06 | **5.30E-06** |
| | | 72" | 2.28E-09 | 2.37E-07 | 2.36E-10 | 4.49E-06 | **4.73E-06** | 2.37E-07 | 2.36E-10 | 3.67E-06 | **3.91E-06** | 2.35E-07 | 2.36E-10 | 1.63E-06 | **1.87E-06** | 2.35E-07 | 2.36E-10 | -9.57E-08 | **1.42E-07** | 2.31E-07 | 2.36E-10 | 5.07E-06 | **5.30E-06** |
| | ASHRAE Climate Zone 4 | 36" | 2.31E-09 | 2.38E-07 | 2.40E-10 | 4.04E-05 | **4.07E-05** | 2.37E-07 | 2.40E-10 | 3.91E-05 | **3.93E-05** | 2.36E-07 | 2.40E-10 | 2.42E-05 | **2.44E-05** | 2.35E-07 | 2.40E-10 | 1.90E-05 | **1.93E-05** | 2.31E-07 | 2.40E-10 | 3.15E-05 | **3.17E-05** |
| | | 48" | 2.24E-09 | 2.30E-07 | 2.38E-10 | 4.04E-05 | **4.07E-05** | 2.31E-07 | 2.38E-10 | 3.91E-05 | **3.93E-05** | 2.28E-07 | 2.38E-10 | 2.42E-05 | **2.44E-05** | 2.27E-07 | 2.38E-10 | 1.90E-05 | **1.93E-05** | 2.24E-07 | 2.38E-10 | 3.15E-05 | **3.17E-05** |
| | | 60" | 2.30E-09 | 2.39E-07 | 2.36E-10 | 4.04E-05 | **4.07E-05** | 2.39E-07 | 2.36E-10 | 3.91E-05 | **3.93E-05** | 2.37E-07 | 2.36E-10 | 2.42E-05 | **2.44E-05** | 2.36E-07 | 2.36E-10 | 1.90E-05 | **1.93E-05** | 2.34E-07 | 2.36E-10 | 3.15E-05 | **3.17E-05** |
| | | 72" | 2.28E-09 | 2.37E-07 | 2.36E-10 | 4.04E-05 | **4.07E-05** | 2.37E-07 | 2.36E-10 | 3.91E-05 | **3.93E-05** | 2.35E-07 | 2.36E-10 | 2.42E-05 | **2.44E-05** | 2.35E-07 | 2.36E-10 | 1.90E-05 | **1.93E-05** | 2.31E-07 | 2.36E-10 | 3.15E-05 | **3.17E-05** |
| | ASHRAE Climate Zone 5 | 36" | 2.31E-09 | 2.38E-07 | 2.40E-10 | 5.73E-05 | **5.75E-05** | 2.37E-07 | 2.40E-10 | 5.48E-05 | **5.50E-05** | 2.36E-07 | 2.40E-10 | 3.45E-05 | **3.48E-05** | 2.35E-07 | 2.40E-10 | 2.42E-05 | **2.45E-05** | 2.31E-07 | 2.40E-10 | 4.32E-05 | **4.34E-05** |
| | | 48" | 2.24E-09 | 2.30E-07 | 2.38E-10 | 5.73E-05 | **5.75E-05** | 2.31E-07 | 2.38E-10 | 5.48E-05 | **5.50E-05** | 2.28E-07 | 2.38E-10 | 3.45E-05 | **3.48E-05** | 2.27E-07 | 2.38E-10 | 2.42E-05 | **2.45E-05** | 2.24E-07 | 2.38E-10 | 4.32E-05 | **4.34E-05** |
| | | 60" | 2.30E-09 | 2.39E-07 | 2.36E-10 | 5.73E-05 | **5.75E-05** | 2.39E-07 | 2.36E-10 | 5.48E-05 | **5.50E-05** | 2.37E-07 | 2.36E-10 | 3.45E-05 | **3.48E-05** | 2.36E-07 | 2.36E-10 | 2.42E-05 | **2.45E-05** | 2.34E-07 | 2.36E-10 | 4.32E-05 | **4.34E-05** |
| | | 72" | 2.28E-09 | 2.37E-07 | 2.36E-10 | 5.73E-05 | **5.75E-05** | 2.37E-07 | 2.36E-10 | 5.48E-05 | **5.50E-05** | 2.35E-07 | 2.36E-10 | 3.45E-05 | **3.48E-05** | 2.35E-07 | 2.36E-10 | 2.42E-05 | **2.45E-05** | 2.31E-07 | 2.36E-10 | 4.32E-05 | **4.34E-05** |
| | ASHRAE Climate Zone 6,7 | 36" | 2.31E-09 | 2.38E-07 | 2.40E-10 | 5.94E-05 | **5.96E-05** | 2.37E-07 | 2.40E-10 | 5.90E-05 | **5.92E-05** | 2.36E-07 | 2.40E-10 | 3.39E-05 | **3.41E-05** | 2.35E-07 | 2.40E-10 | 2.36E-05 | **2.38E-05** | 2.31E-07 | 2.40E-10 | 4.59E-05 | **4.61E-05** |
| | | 48" | 2.24E-09 | 2.30E-07 | 2.38E-10 | 5.94E-05 | **5.96E-05** | 2.31E-07 | 2.38E-10 | 5.90E-05 | **5.92E-05** | 2.28E-07 | 2.38E-10 | 3.39E-05 | **3.41E-05** | 2.27E-07 | 2.38E-10 | 2.36E-05 | **2.38E-05** | 2.24E-07 | 2.38E-10 | 4.59E-05 | **4.61E-05** |
| | | 60" | 2.30E-09 | 2.39E-07 | 2.36E-10 | 5.94E-05 | **5.96E-05** | 2.39E-07 | 2.36E-10 | 5.90E-05 | **5.92E-05** | 2.37E-07 | 2.36E-10 | 3.39E-05 | **3.41E-05** | 2.36E-07 | 2.36E-10 | 2.36E-05 | **2.38E-05** | 2.34E-07 | 2.36E-10 | 4.59E-05 | **4.61E-05** |
| | | 72" | 2.28E-09 | 2.37E-07 | 2.36E-10 | 5.94E-05 | **5.96E-05** | 2.37E-07 | 2.36E-10 | 5.90E-05 | **5.92E-05** | 2.35E-07 | 2.36E-10 | 3.39E-05 | **3.41E-05** | 2.35E-07 | 2.36E-10 | 2.36E-05 | **2.38E-05** | 2.31E-07 | 2.36E-10 | 4.59E-05 | **4.61E-05** |
| | Canada | 36" | 7.82E-09 | 2.38E-07 | 2.40E-10 | 3.26E-05 | **3.29E-05** | 2.37E-07 | 2.40E-10 | 2.91E-05 | **2.94E-05** | 2.36E-07 | 2.40E-10 | 1.85E-05 | **1.88E-05** | 2.35E-07 | 2.40E-10 | 1.44E-05 | **1.47E-05** | 2.31E-07 | 2.40E-10 | 2.96E-05 | **2.98E-05** |
| | | 48" | 7.64E-09 | 2.30E-07 | 2.38E-10 | 3.26E-05 | **3.29E-05** | 2.31E-07 | 2.38E-10 | 2.91E-05 | **2.94E-05** | 2.28E-07 | 2.38E-10 | 1.85E-05 | **1.87E-05** | 2.27E-07 | 2.38E-10 | 1.44E-05 | **1.47E-05** | 2.24E-07 | 2.38E-10 | 2.96E-05 | **2.98E-05** |
| | | 60" | 7.84E-09 | 2.39E-07 | 2.36E-10 | 3.26E-05 | **3.29E-05** | 2.39E-07 | 2.36E-10 | 2.91E-05 | **2.94E-05** | 2.37E-07 | 2.36E-10 | 1.85E-05 | **1.88E-05** | 2.36E-07 | 2.36E-10 | 1.44E-05 | **1.47E-05** | 2.34E-07 | 2.36E-10 | 2.96E-05 | **2.98E-05** |
| | | 72" | 7.71E-09 | 2.37E-07 | 2.36E-10 | 3.26E-05 | **3.29E-05** | 2.37E-07 | 2.36E-10 | 2.91E-05 | **2.94E-05** | 2.35E-07 | 2.36E-10 | 1.85E-05 | **1.88E-05** | 2.35E-07 | 2.36E-10 | 1.44E-05 | **1.47E-05** | 2.31E-07 | 2.36E-10 | 2.96E-05 | **2.98E-05** |
| | Mexico | 36" | 2.20E-09 | | | | | | | | | | | | | | | | | 2.31E-07 | 2.40E-10 | -3.84E-05 | **-3.82E-05** |
| | | 48" | 2.16E-09 | | | | | | | | | | | | | | | | | 2.24E-07 | 2.38E-10 | -3.84E-05 | **-3.82E-05** |
| | | 60" | 2.24E-09 | | | | | | | | | | | | | | | | | 2.34E-07 | 2.36E-10 | -3.84E-05 | **-3.82E-05** |
| | | 72" | 2.18E-09 | | | | | | | | | | | | | | | | | 2.31E-07 | 2.36E-10 | -3.84E-05 | **-3.82E-05** |
| Europe | France | 36" | 1.11E-07 | | | | | | | | | | | | | | | | | 2.31E-07 | 2.17E-10 | 1.29E-05 | **1.33E-05** |
| | | 48" | 1.09E-07 | | | | | | | | | | | | | | | | | 2.24E-07 | 2.14E-10 | 1.29E-05 | **1.33E-05** |
| | | 60" | 1.12E-07 | | | | | | | | | | | | | | | | | 2.34E-07 | 2.16E-10 | 1.29E-05 | **1.33E-05** |
| | | 72" | 1.10E-07 | | | | | | | | | | | | | | | | | 2.31E-07 | 2.14E-10 | 1.29E-05 | **1.33E-05** |
| | Northern Europe | 36" | 1.13E-07 | | | | | | | | | | | | | | | | | 2.31E-07 | 1.62E-10 | 2.21E-05 | **2.24E-05** |
| | | 48" | 1.11E-07 | | | | | | | | | | | | | | | | | 2.24E-07 | 1.56E-10 | 2.21E-05 | **2.24E-05** |
| | | 60" | 1.14E-07 | | | | | | | | | | | | | | | | | 2.34E-07 | 1.63E-10 | 2.21E-05 | **2.24E-05** |
| | | 72" | 1.12E-07 | | | | | | | | | | | | | | | | | 2.31E-07 | 1.59E-10 | 2.21E-05 | **2.24E-05** |
| | Russia | 36" | 1.19E-07 | | | | | | | | | | | | | | | | | 2.31E-07 | 2.40E-10 | 3.03E-05 | **3.06E-05** |
| | | 48" | 1.17E-07 | | | | | | | | | | | | | | | | | 2.24E-07 | 2.38E-10 | 3.03E-05 | **3.06E-05** |
| | | 60" | 1.20E-07 | | | | | | | | | | | | | | | | | 2.34E-07 | 2.36E-10 | 3.03E-05 | **3.07E-05** |
| | | 72" | 1.18E-07 | | | | | | | | | | | | | | | | | 2.31E-07 | 2.36E-10 | 3.03E-05 | **3.06E-05** |
| | Scandivania | 36" | 1.10E-07 | 2.38E-07 | 2.91E-10 | 2.92E-05 | **2.95E-05** | 2.37E-07 | 2.91E-10 | 2.53E-05 | **2.57E-05** | | | | | | | | | 2.31E-07 | 2.91E-10 | 2.13E-05 | **2.16E-05** |
| | | 48" | 1.07E-07 | 2.30E-07 | 2.85E-10 | 2.92E-05 | **2.95E-05** | 2.31E-07 | 2.85E-10 | 2.53E-05 | **2.57E-05** | | | | | | | | | 2.24E-07 | 2.85E-10 | 2.13E-05 | **2.16E-05** |
| | | 60" | 1.10E-07 | 2.39E-07 | 2.92E-10 | 2.92E-05 | **2.95E-05** | 2.39E-07 | 2.92E-10 | 2.53E-05 | **2.57E-05** | | | | | | | | | 2.34E-07 | 2.92E-10 | 2.13E-05 | **2.16E-05** |
| | | 72" | 1.08E-07 | 2.37E-07 | 2.88E-10 | 2.92E-05 | **2.95E-05** | 2.37E-07 | 2.88E-10 | 2.53E-05 | **2.57E-05** | | | | | | | | | 2.31E-07 | 2.88E-10 | 2.13E-05 | **2.16E-05** |
| | Southern Europe | 36" | 1.13E-07 | | | | | | | | | | | | | | | | | 2.31E-07 | 1.62E-10 | -9.66E-06 | **-9.32E-06** |
| | | 48" | 1.11E-07 | | | | | | | | | | | | | | | | | 2.24E-07 | 1.56E-10 | -9.66E-06 | **-9.33E-06** |
| | | 60" | 1.14E-07 | | | | | | | | | | | | | | | | | 2.34E-07 | 1.63E-10 | -9.66E-06 | **-9.32E-06** |
| | | 72" | 1.12E-07 | | | | | | | | | | | | | | | | | 2.31E-07 | 1.59E-10 | -9.66E-06 | **-9.32E-06** |
| | United Kingdom | 36" | 1.07E-07 | 2.38E-07 | 2.40E-10 | 2.36E-05 | **2.39E-05** | 2.37E-07 | 2.40E-10 | 2.04E-05 | **2.08E-05** | 2.36E-07 | 2.40E-10 | 1.11E-05 | **1.14E-05** | 2.35E-07 | 2.40E-10 | 9.01E-06 | **9.35E-06** | 2.31E-07 | 2.40E-10 | 1.47E-05 | **1.50E-05** |
| | | 48" | 1.05E-07 | 2.30E-07 | 2.38E-10 | 2.36E-05 | **2.39E-05** | 2.31E-07 | 2.38E-10 | 2.04E-05 | **2.08E-05** | 2.28E-07 | 2.38E-10 | 1.11E-05 | **1.14E-05** | 2.27E-07 | 2.38E-10 | 9.01E-06 | **9.34E-06** | 2.24E-07 | 2.38E-10 | 1.47E-05 | **1.50E-05** |
| | | 60" | 1.08E-07 | 2.39E-07 | 2.37E-10 | 2.36E-05 | **2.39E-05** | 2.39E-07 | 2.37E-10 | 2.04E-05 | **2.08E-05** | 2.37E-07 | 2.37E-10 | 1.11E-05 | **1.14E-05** | 2.36E-07 | 2.37E-10 | 9.01E-06 | **9.36E-06** | 2.34E-07 | 2.37E-10 | 1.47E-05 | **1.50E-05** |
| | | 72" | 1.06E-07 | 2.37E-07 | 2.36E-10 | 2.36E-05 | **2.39E-05** | 2.37E-07 | 2.36E-10 | 2.04E-05 | **2.08E-05** | 2.35E-07 | 2.36E-10 | 1.11E-05 | **1.14E-05** | 2.35E-07 | 2.36E-10 | 9.01E-06 | **9.35E-06** | 2.31E-07 | 2.36E-10 | 1.47E-05 | **1.50E-05** |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

## 9.2 Ozone layer depletion potential: Asia and South America

| Ozone Layer Depletion (kg CFC-11 eq/m²) | | PS Series | LX 40 | | | | Hilite 40 | | | | 4 Mil Clear | Sentinel 4 Mil Clear | | | | CDA & OSW | Silver AG 50 Low-E | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Transportation to Customer | Manufacturing | End-of-Life | Operational Energy | Net CFC-11 eq | Manufacturing | End-of-Life | Operational Energy | Net CFC-11 eq | Transportation to Customer | Manufacturing | End-of-Life | Operational Energy | Net CFC-11 eq | Transportation to Customer | Manufacturing | End-of-Life | Operational Energy | Net CFC-11 eq |
| Asia and Pacific | | | | | | | | | | | | | | | | | | | | |
| Australia | 36" | | | | | | | | | | 2.57E-07 | 3.05E-07 | 4.47E-10 | -5.71E-07 | **-8.70E-09** | 1.52E-07 | 1.81E-07 | 2.40E-10 | -5.03E-06 | **-4.70E-06** |
| | 48" | | | | | | | | | | 2.54E-07 | 2.94E-07 | 4.44E-10 | -5.71E-07 | **-2.32E-08** | 1.49E-07 | 2.13E-07 | 2.38E-10 | -5.03E-06 | **-4.67E-06** |
| | 60" | | | | | | | | | | 2.58E-07 | 3.06E-07 | 4.43E-10 | -5.71E-07 | **-6.66E-09** | 1.52E-07 | 2.40E-07 | 2.73E-10 | -5.03E-06 | **-4.64E-06** |
| | 72" | | | | | | | | | | 2.56E-07 | 3.04E-07 | 4.42E-10 | -5.71E-07 | **-1.05E-08** | 1.50E-07 | | | | |
| China, Mid-East Coast | 36" | | | | | | | | | | 2.09E-07 | | | | | 1.23E-07 | | | | |
| | 48" | | | | | | | | | | 2.06E-07 | | | | | 1.21E-07 | | | | |
| | 60" | | | | | | | | | | 2.10E-07 | | | | | 1.24E-07 | | | | |
| | 72" | | | | | | | | | | 2.07E-07 | | | | | 1.22E-07 | | | | |
| North-East Asia | 36" | | | | | | | | | | 2.09E-07 | | | | | 1.23E-07 | 1.81E-07 | 2.40E-10 | 2.77E-05 | **2.80E-05** |
| | 48" | | | | | | | | | | 2.06E-07 | | | | | 1.21E-07 | 2.13E-07 | 2.38E-10 | 2.77E-05 | **2.80E-05** |
| | 60" | | | | | | | | | | 2.10E-07 | | | | | 1.24E-07 | 2.40E-07 | 2.73E-10 | 2.77E-05 | **2.81E-05** |
| | 72" | | | | | | | | | | 2.07E-07 | | | | | 1.22E-07 | | | | |
| China, South-East | 36" | | | | | | | | | | | | | | | 1.23E-07 | | | | |
| | 48" | | | | | | | | | | | | | | | 1.21E-07 | | | | |
| | 60" | | | | | | | | | | | | | | | 1.24E-07 | | | | |
| | 72" | | | | | | | | | | | | | | | 1.22E-07 | | | | |
| India | 36" | | | | | | | | | | | | | | | | | | | |
| | 48" | | | | | | | | | | | | | | | | | | | |
| | 60" | | | | | | | | | | | | | | | | | | | |
| | 72" | | | | | | | | | | | | | | | | | | | |
| Japan | 36" | | | | | | | | | | | | | | | 1.08E-07 | | | | |
| | 48" | | | | | | | | | | | | | | | 1.06E-07 | | | | |
| | 60" | | | | | | | | | | | | | | | 1.09E-07 | | | | |
| | 72" | | | | | | | | | | | | | | | 1.07E-07 | | | | |
| Malaysia | 36" | | | | | | | | | | | | | | | 1.66E-07 | | | | |
| | 48" | | | | | | | | | | | | | | | 1.62E-07 | | | | |
| | 60" | | | | | | | | | | | | | | | 1.66E-07 | | | | |
| | 72" | | | | | | | | | | | | | | | 1.62E-07 | | | | |
| Middle East | 36" | | | | | | | | | | | | | | | 1.62E-07 | 1.81E-07 | 2.40E-10 | -2.79E-05 | **-2.75E-05** |
| | 48" | | | | | | | | | | | | | | | 1.58E-07 | 2.13E-07 | 2.38E-10 | -2.79E-05 | **-2.75E-05** |
| | 60" | | | | | | | | | | | | | | | 1.62E-07 | 2.40E-07 | 2.73E-10 | -2.79E-05 | **-2.75E-05** |
| | 72" | | | | | | | | | | | | | | | 1.59E-07 | | | | |
| Turkey | 36" | | | | | | | | | | | | | | | 1.37E-07 | | | | |
| | 48" | | | | | | | | | | | | | | | 1.34E-07 | | | | |
| | 60" | | | | | | | | | | | | | | | 1.38E-07 | | | | |
| | 72" | | | | | | | | | | | | | | | 1.35E-07 | | | | |
| South America | | | | | | | | | | | | | | | | | | | | |
| Argentina | 36" | | | | | | | | | | | | | | | 1.16E-07 | | | | |
| | 48" | 1.54E-07 | | | | | | | | | | | | | | 1.14E-07 | | | | |
| | 60" | 1.57E-07 | | | | | | | | | | | | | | 1.17E-07 | | | | |
| | 72" | | | | | | | | | | | | | | | 1.15E-07 | | | | |
| Brazil | 36" | | | | | | | | | | | | | | | 1.09E-07 | | | | |
| | 48" | 1.45E-07 | | | | | | | | | | | | | | 1.07E-07 | | | | |
| | 60" | 1.48E-07 | 2.92E-07 | 3.40E-10 | -1.42E-05 | **-1.37E-05** | | | | | | | | | | 1.10E-07 | | | | |
| | 72" | | | | | | | | | | | | | | | 1.08E-07 | | | | |
| Venezuela | 36" | | | | | | | | | | | | | | | 6.83E-08 | | | | |
| | 48" | | | | | | | | | | | | | | | 6.71E-08 | | | | |
| | 60" | | | | | | | | | | | | | | | 6.88E-08 | | | | |
| | 72" | | | | | | | | | | | | | | | 6.76E-08 | | | | |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

## 9.2 Ozone layer depletion potential: Asia and South America (cont.)

| Ozone Layer Depletion (kg CFC-11 eq/m²) | | CDA & OSW | TrueVue 5 | | | | TrueVue 15 | | | | TrueVue 30 | | | | TrueVue 40 | | | | Sentinel Silver 20 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Transportation to Customer | Manufacturing | End-of-Life | Operational Energy | **Net CFC-11 eq** | Manufacturing | End-of-Life | Operational Energy | **Net CFC-11 eq** | Manufacturing | End-of-Life | Operational Energy | **Net CFC-11 eq** | Manufacturing | End-of-Life | Operational Energy | **Net CFC-11 eq** | Manufacturing | End-of-Life | Operational Energy | **Net CFC-11 eq** |
| Asia and Pacific | | | | | | | | | | | | | | | | | | | | | | |
| Australia | 36" | 1.52E-07 | | | | | | | | | | | | | | | | | 2.31E-07 | 2.40E-10 | 3.34E-06 | **3.73E-06** |
| | 48" | 1.49E-07 | | | | | | | | | | | | | | | | | 2.24E-07 | 2.38E-10 | 3.34E-06 | **3.72E-06** |
| | 60" | 1.52E-07 | | | | | | | | | | | | | | | | | 2.34E-07 | 2.36E-10 | 3.34E-06 | **3.73E-06** |
| | 72" | 1.50E-07 | | | | | | | | | | | | | | | | | 2.31E-07 | 2.36E-10 | 3.34E-06 | **3.73E-06** |
| China, Mid-East Coast | 36" | 1.23E-07 | | | | | | | | | | | | | | | | | 2.31E-07 | 2.40E-10 | 1.56E-05 | **1.60E-05** |
| | 48" | 1.21E-07 | | | | | | | | | | | | | | | | | 2.24E-07 | 2.38E-10 | 1.56E-05 | **1.60E-05** |
| | 60" | 1.24E-07 | | | | | | | | | | | | | | | | | 2.34E-07 | 2.36E-10 | 1.56E-05 | **1.60E-05** |
| | 72" | 1.22E-07 | | | | | | | | | | | | | | | | | 2.31E-07 | 2.36E-10 | 1.56E-05 | **1.60E-05** |
| North-East Asia | 36" | 1.23E-07 | 2.38E-07 | 2.40E-10 | 6.67E-05 | **6.71E-05** | 2.37E-07 | 2.40E-10 | 6.50E-05 | **6.53E-05** | 2.36E-07 | 2.40E-10 | 4.20E-05 | **4.24E-05** | 2.35E-07 | 2.40E-10 | 3.03E-05 | **3.07E-05** | | | | |
| | 48" | 1.21E-07 | 2.30E-07 | 2.38E-10 | 6.67E-05 | **6.71E-05** | 2.31E-07 | 2.38E-10 | 6.50E-05 | **6.53E-05** | 2.28E-07 | 2.38E-10 | 4.20E-05 | **4.24E-05** | 2.27E-07 | 2.38E-10 | 3.03E-05 | **3.07E-05** | | | | |
| | 60" | 1.24E-07 | 2.39E-07 | 2.36E-10 | 6.67E-05 | **6.71E-05** | 2.39E-07 | 2.36E-10 | 6.50E-05 | **6.53E-05** | 2.37E-07 | 2.36E-10 | 4.20E-05 | **4.24E-05** | 2.36E-07 | 2.36E-10 | 3.03E-05 | **3.07E-05** | | | | |
| | 72" | 1.22E-07 | 2.37E-07 | 2.36E-10 | 6.67E-05 | **6.71E-05** | 2.37E-07 | 2.36E-10 | 6.50E-05 | **6.53E-05** | 2.35E-07 | 2.36E-10 | 4.20E-05 | **4.24E-05** | 2.35E-07 | 2.36E-10 | 3.03E-05 | **3.07E-05** | | | | |
| China, South-East | 36" | 1.23E-07 | | | | | | | | | | | | | | | | | 2.31E-07 | 2.40E-10 | -6.68E-06 | **-6.32E-06** |
| | 48" | 1.21E-07 | | | | | | | | | | | | | | | | | 2.24E-07 | 2.38E-10 | -6.68E-06 | **-6.33E-06** |
| | 60" | 1.24E-07 | | | | | | | | | | | | | | | | | 2.34E-07 | 2.36E-10 | -6.68E-06 | **-6.32E-06** |
| | 72" | 1.22E-07 | | | | | | | | | | | | | | | | | 2.31E-07 | 2.36E-10 | -6.68E-06 | **-6.33E-06** |
| India | 36" | | | | | | | | | | | | | | | | | | | | | |
| | 48" | | | | | | | | | | | | | | | | | | | | | |
| | 60" | | | | | | | | | | | | | | | | | | | | | |
| | 72" | | | | | | | | | | | | | | | | | | | | | |
| Japan | 36" | 1.08E-07 | | | | | | | | | | | | | | | | | 2.31E-07 | 2.40E-10 | 1.31E-05 | **1.34E-05** |
| | 48" | 1.06E-07 | | | | | | | | | | | | | | | | | 2.24E-07 | 2.38E-10 | 1.31E-05 | **1.34E-05** |
| | 60" | 1.09E-07 | | | | | | | | | | | | | | | | | 2.34E-07 | 2.36E-10 | 1.31E-05 | **1.34E-05** |
| | 72" | 1.07E-07 | | | | | | | | | | | | | | | | | 2.31E-07 | 2.36E-10 | 1.31E-05 | **1.34E-05** |
| Malaysia | 36" | 1.66E-07 | | | | | | | | | | | | | | | | | 2.31E-07 | 2.40E-10 | -7.25E-05 | **-7.21E-05** |
| | 48" | 1.62E-07 | | | | | | | | | | | | | | | | | 2.24E-07 | 2.38E-10 | -7.25E-05 | **-7.21E-05** |
| | 60" | 1.66E-07 | | | | | | | | | | | | | | | | | 2.34E-07 | 2.36E-10 | -7.25E-05 | **-7.21E-05** |
| | 72" | 1.62E-07 | | | | | | | | | | | | | | | | | 2.38E-07 | 2.28E-10 | -7.25E-05 | **-7.21E-05** |
| Middle East | 36" | 1.62E-07 | 2.38E-07 | 2.40E-10 | -4.35E-05 | **-4.31E-05** | 2.37E-07 | 2.40E-10 | -4.21E-05 | **-4.17E-05** | 2.36E-07 | 2.40E-10 | -3.01E-05 | **-2.97E-05** | 2.35E-07 | 2.40E-10 | -2.36E-05 | **-2.32E-05** | 2.31E-07 | 2.40E-10 | -2.33E-05 | **-2.29E-05** |
| | 48" | 1.58E-07 | 2.30E-07 | 2.38E-10 | -4.35E-05 | **-4.31E-05** | 2.31E-07 | 2.38E-10 | -4.21E-05 | **-4.17E-05** | 2.28E-07 | 2.38E-10 | -3.01E-05 | **-2.98E-05** | 2.27E-07 | 2.38E-10 | -2.36E-05 | **-2.32E-05** | 2.24E-07 | 2.38E-10 | -2.33E-05 | **-2.29E-05** |
| | 60" | 1.62E-07 | 2.39E-07 | 2.36E-10 | -4.35E-05 | **-4.31E-05** | 2.39E-07 | 2.36E-10 | -4.21E-05 | **-4.17E-05** | 2.37E-07 | 2.36E-10 | -3.01E-05 | **-2.97E-05** | 2.36E-07 | 2.36E-10 | -2.36E-05 | **-2.32E-05** | 2.34E-07 | 2.36E-10 | -2.33E-05 | **-2.29E-05** |
| | 72" | 1.59E-07 | 2.37E-07 | 2.36E-10 | -4.35E-05 | **-4.31E-05** | 2.37E-07 | 2.36E-10 | -4.21E-05 | **-4.17E-05** | 2.35E-07 | 2.36E-10 | -3.01E-05 | **-2.97E-05** | 2.35E-07 | 2.36E-10 | -2.36E-05 | **-2.32E-05** | 2.31E-07 | 2.36E-10 | -2.33E-05 | **-2.29E-05** |
| Turkey | 36" | 1.37E-07 | | | | | | | | | | | | | | | | | 2.31E-07 | 2.40E-10 | -1.19E-05 | **-1.16E-05** |
| | 48" | 1.34E-07 | | | | | | | | | | | | | | | | | 2.24E-07 | 2.38E-10 | -1.19E-05 | **-1.16E-05** |
| | 60" | 1.38E-07 | | | | | | | | | | | | | | | | | 2.34E-07 | 2.36E-10 | -1.19E-05 | **-1.16E-05** |
| | 72" | 1.35E-07 | | | | | | | | | | | | | | | | | 2.31E-07 | 2.36E-10 | -1.19E-05 | **-1.16E-05** |
| South America | | | | | | | | | | | | | | | | | | | | | | |
| Argentina | 36" | 1.16E-07 | | | | | | | | | | | | | | | | | 2.31E-07 | 2.40E-10 | -1.21E-05 | **-1.18E-05** |
| | 48" | 1.14E-07 | | | | | | | | | | | | | | | | | 2.24E-07 | 2.38E-10 | -1.21E-05 | **-1.18E-05** |
| | 60" | 1.17E-07 | | | | | | | | | | | | | | | | | 2.35E-07 | 2.36E-10 | -1.21E-05 | **-1.18E-05** |
| | 72" | 1.15E-07 | | | | | | | | | | | | | | | | | 2.31E-07 | 2.36E-10 | -1.21E-05 | **-1.18E-05** |
| Brazil | 36" | 1.09E-07 | | | | | | | | | | | | | | | | | 2.31E-07 | 2.40E-10 | -1.15E-05 | **-1.11E-05** |
| | 48" | 1.07E-07 | | | | | | | | | | | | | | | | | 2.24E-07 | 2.38E-10 | -1.15E-05 | **-1.11E-05** |
| | 60" | 1.10E-07 | | | | | | | | | | | | | | | | | 2.34E-07 | 2.36E-10 | -1.15E-05 | **-1.11E-05** |
| | 72" | 1.08E-07 | | | | | | | | | | | | | | | | | 2.31E-07 | 2.36E-10 | -1.15E-05 | **-1.11E-05** |
| Venezuela | 36" | 6.83E-08 | 2.38E-07 | 2.40E-10 | -8.72E-05 | **-8.69E-05** | 2.37E-07 | 2.40E-10 | -8.47E-05 | **-8.44E-05** | | | | | | | | | 2.31E-07 | 2.40E-10 | -5.56E-05 | **-5.53E-05** |
| | 48" | 6.71E-08 | 2.30E-07 | 2.38E-10 | -8.72E-05 | **-8.69E-05** | 2.54E-07 | 2.38E-10 | -8.47E-05 | **-8.44E-05** | | | | | | | | | 2.24E-07 | 2.38E-10 | -5.56E-05 | **-5.53E-05** |
| | 60" | 6.88E-08 | 2.39E-07 | 2.36E-10 | -8.72E-05 | **-8.69E-05** | 2.39E-07 | 2.36E-10 | -8.47E-05 | **-8.44E-05** | | | | | | | | | 2.34E-07 | 2.36E-10 | -5.56E-05 | **-5.52E-05** |
| | 72" | 6.76E-08 | 2.37E-07 | 2.36E-10 | -8.72E-05 | **-8.69E-05** | 2.37E-07 | 2.36E-10 | -8.47E-05 | **-8.44E-05** | | | | | | | | | 2.31E-07 | 2.36E-10 | -5.56E-05 | **-5.53E-05** |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

## 9.2 Ozone layer depletion potential: Asia and South America (cont.)

| Ozone Layer Depletion (kg CFC-11 eq/m²) | | | CDA & OSW | Sentinel Silver 35 | | | | Sentinel Stainless Steel 15 | | | | Sentinel Stainless Steel 25 | | | | Sentinel Stainless Steel 40 | | | | Sentinel Stainless Steel 45 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Transportation to Customer | Manufacturing | End-of-Life | Operational Energy | **Net CFC-11 eq** | Manufacturing | End-of-Life | Operational Energy | **Net CFC-11 eq** | Manufacturing | End-of-Life | Operational Energy | **Net CFC-11 eq** | Manufacturing | End-of-Life | Operational Energy | **Net CFC-11 eq** | Manufacturing | End-of-Life | Operational Energy | **Net CFC-11 eq** |
| Asia and Pacific | Australia | 36" | 1.52E-07 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.49E-07 | 2.75E-07 | 2.38E-10 | 1.01E-06 | **1.43E-06** | | | | | | | | | | | | | | | | |
| | | 60" | 1.52E-07 | 2.34E-07 | 2.36E-10 | 1.01E-06 | **1.40E-06** | | | | | 2.35E-07 | 2.36E-10 | 1.21E-06 | **1.60E-06** | 2.34E-07 | 2.36E-10 | 6.56E-07 | **1.04E-06** | | | | |
| | | 72" | 1.50E-07 | 2.31E-07 | 2.36E-10 | 1.01E-06 | **1.39E-06** | | | | | 2.31E-07 | 2.36E-10 | 1.21E-06 | **1.59E-06** | 2.31E-07 | 2.36E-10 | 6.56E-07 | **1.04E-06** | | | | |
| | China, Mid-East Coast | 36" | 1.23E-07 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.21E-07 | 2.24E-07 | 2.38E-10 | 1.24E-05 | **1.28E-05** | | | | | | | | | | | | | | | | |
| | | 60" | 1.24E-07 | 2.34E-07 | 2.36E-10 | 1.24E-05 | **1.28E-05** | 2.35E-07 | 2.36E-10 | 1.44E-05 | **1.47E-05** | 2.35E-07 | 2.36E-10 | 1.05E-05 | **1.08E-05** | | | | | | | | |
| | | 72" | 1.22E-07 | 2.31E-07 | 2.36E-10 | 1.24E-05 | **1.28E-05** | 2.32E-07 | 2.36E-10 | 1.44E-05 | **1.47E-05** | 2.31E-07 | 2.36E-10 | 1.05E-05 | **1.08E-05** | | | | | | | | |
| | North-East Asia | 36" | 1.23E-07 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.21E-07 | | | | | | | | | | | | | | | | | | | | |
| | | 60" | 1.24E-07 | | | | | 2.35E-07 | 2.36E-10 | 4.19E-05 | **4.23E-05** | 2.35E-07 | 2.36E-10 | 3.44E-05 | **3.48E-05** | | | | | | | | |
| | | 72" | 1.22E-07 | | | | | 2.32E-07 | 2.36E-10 | 4.19E-05 | **4.23E-05** | 2.31E-07 | 2.36E-10 | 3.44E-05 | **3.48E-05** | | | | | | | | |
| | China, South-East | 36" | 1.23E-07 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.21E-07 | 2.24E-07 | 2.38E-10 | -5.23E-06 | **-4.89E-06** | | | | | | | | | | | | | | | | |
| | | 60" | 1.24E-07 | 2.34E-07 | 2.36E-10 | -5.23E-06 | **-4.87E-06** | | | | | | | | | | | | | | | | |
| | | 72" | 1.22E-07 | 2.31E-07 | 2.36E-10 | -5.23E-06 | **-4.88E-06** | | | | | | | | | | | | | | | | |
| | India | 36" | | | | | | | | | | | | | | | | | | | | | |
| | | 48" | | | | | | | | | | | | | | | | | | | | | |
| | | 60" | | | | | | | | | | | | | | | | | | | | | |
| | | 72" | | | | | | | | | | | | | | | | | | | | | |
| | Japan | 36" | 1.08E-07 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.06E-07 | 2.24E-07 | 2.38E-10 | 1.04E-05 | **1.07E-05** | | | | | | | | | | | | | | | | |
| | | 60" | 1.09E-07 | 2.34E-07 | 2.36E-10 | 1.04E-05 | **1.08E-05** | | | | | | | | | | | | | | | | |
| | | 72" | 1.07E-07 | 2.31E-07 | 2.36E-10 | 1.04E-05 | **1.08E-05** | | | | | | | | | | | | | | | | |
| | Malaysia | 36" | 1.66E-07 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.62E-07 | | | | | | | | | | | | | | | | | | | | |
| | | 60" | 1.66E-07 | | | | | 2.35E-07 | 2.36E-10 | -6.59E-05 | **-6.55E-05** | | | | | | | | | | | | |
| | | 72" | 1.62E-07 | | | | | 2.34E-07 | 2.36E-10 | -6.59E-05 | **-6.55E-05** | | | | | | | | | | | | |
| | Middle East | 36" | 1.62E-07 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.58E-07 | | | | | | | | | | | | | | | | | | | | |
| | | 60" | 1.62E-07 | | | | | | | | | | | | | | | | | | | | |
| | | 72" | 1.59E-07 | | | | | | | | | | | | | | | | | | | | |
| | Turkey | 36" | 1.37E-07 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.34E-07 | 2.24E-07 | 2.38E-10 | -1.18E-05 | **-1.14E-05** | | | | | | | | | | | | | | | | |
| | | 60" | 1.38E-07 | 2.34E-07 | 2.36E-10 | -1.18E-05 | **-1.14E-05** | | | | | | | | | | | | | | | | |
| | | 72" | 1.35E-07 | 2.31E-07 | 2.36E-10 | -1.18E-05 | **-1.14E-05** | | | | | | | | | | | | | | | | |
| South America | Argentina | 36" | 1.16E-07 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.14E-07 | 2.24E-07 | 2.38E-10 | -1.03E-05 | **-1.00E-05** | | | | | | | | | | | | | | | | |
| | | 60" | 1.17E-07 | 2.34E-07 | 2.36E-10 | -1.03E-05 | **-9.99E-06** | 2.35E-07 | 2.36E-10 | -1.12E-05 | **-1.08E-05** | | | | | | | | | 2.33E-07 | 2.36E-10 | -6.57E-06 | **-6.22E-06** |
| | | 72" | 1.15E-07 | 2.31E-07 | 2.36E-10 | -1.03E-05 | **-9.99E-06** | 2.32E-07 | 2.36E-10 | -1.12E-05 | **-1.08E-05** | | | | | | | | | 2.31E-07 | 2.36E-10 | -6.57E-06 | **-6.22E-06** |
| | Brazil | 36" | 1.09E-07 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.07E-07 | | | | | | | | | | | | | | | | | | | | |
| | | 60" | 1.10E-07 | | | | | | | | | | | | | | | | | | | | |
| | | 72" | 1.08E-07 | | | | | | | | | | | | | | | | | | | | |
| | Venezuela | 36" | 6.83E-08 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 6.71E-08 | | | | | | | | | | | | | | | | | | | | |
| | | 60" | 6.88E-08 | | | | | | | | | | | | | | | | | | | | |
| | | 72" | 6.76E-08 | | | | | | | | | | | | | | | | | | | | |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

## 9.3 Acidification potential: North America and Europe

| Acidification Potential (kg $SO_2$-eq/$m^2$) | | PS Series | LX 40 | | | | Hilite 40 | | | | 4 Mil Clear | Sentinel 4 Mil Clear | | | | CDA & OSW | Silver AG 50 Low-E | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Transportation to Customer | Manufacturing | End-of-life | Operational Energy | Net kg $SO_2$-eq | Manufacturing | End-of-life | Operational Energy | Net kg $SO_2$-eq | Transportation to Customer | Manufacturing | End-of-life | Operational Energy | Net kg $SO_2$-eq | Transportation to Customer | Manufacturing | End-of-life | Operational Energy | Net kg $SO_2$-eq |
| North America | ASHRAE Climate Zone 1,2 | 36" | | | | | | | | | 1.66E-04 | 0.016 | 2.35E-05 | -0.49 | **-0.47** | 9.88E-05 | 0.012 | 1.25E-05 | -6.26 | **-6.25** |
| | | 48" | 1.30E-04 | | | | 0.036 | 1.79E-05 | -6.94 | **-6.90** | 1.65E-04 | 0.015 | 2.34E-05 | -0.49 | **-0.48** | 9.60E-05 | 0.013 | 1.23E-05 | -6.26 | **-6.25** |
| | | 60" | 1.33E-04 | | | | | | | | 1.67E-04 | 0.015 | 2.33E-05 | -0.49 | **-0.47** | 9.84E-05 | 0.014 | 1.42E-05 | -6.26 | **-6.25** |
| | | 72" | | | | | | | | | 1.65E-04 | 0.016 | 2.33E-05 | -0.49 | **-0.47** | 9.77E-05 | | | | |
| | ASHRAE Climate Zone 3 | 36" | | | | | | | | | 1.66E-04 | 0.016 | 2.35E-05 | -0.98 | **-0.97** | 9.88E-05 | 0.012 | 1.25E-05 | -5.62 | **-5.61** |
| | | 48" | 1.30E-04 | | | | 0.036 | 1.79E-05 | -5.95 | **-5.92** | 1.65E-04 | 0.015 | 2.34E-05 | -0.98 | **-0.97** | 9.60E-05 | 0.013 | 1.23E-05 | -5.62 | **-5.61** |
| | | 60" | 1.33E-04 | | | | | | | | 1.67E-04 | 0.015 | 2.33E-05 | -0.98 | **-0.97** | 9.84E-05 | 0.014 | 1.42E-05 | -5.62 | **-5.61** |
| | | 72" | | | | | | | | | 1.65E-04 | 0.016 | 2.33E-05 | -0.98 | **-0.97** | 9.77E-05 | | | | |
| | ASHRAE Climate Zone 4 | 36" | | | | | | | | | 1.66E-04 | 0.016 | 2.35E-05 | -0.69 | **-0.67** | 9.88E-05 | 0.012 | 1.25E-05 | -3.85 | **-3.84** |
| | | 48" | 1.30E-04 | | | | 0.036 | 1.79E-05 | -4.18 | **-4.14** | 1.65E-04 | 0.015 | 2.34E-05 | -0.69 | **-0.67** | 9.60E-05 | 0.013 | 1.23E-05 | -3.85 | **-3.84** |
| | | 60" | 1.33E-04 | | | | | | | | 1.67E-04 | 0.015 | 2.33E-05 | -0.69 | **-0.67** | 9.84E-05 | 0.014 | 1.42E-05 | -3.85 | **-3.84** |
| | | 72" | | | | | | | | | 1.65E-04 | 0.016 | 2.33E-05 | -0.69 | **-0.67** | 9.77E-05 | | | | |
| | ASHRAE Climate Zone 5 | 36" | | | | | | | | | 1.66E-04 | 0.016 | 2.35E-05 | -0.64 | **-0.63** | 9.88E-05 | 0.012 | 1.25E-05 | -3.49 | **-3.47** |
| | | 48" | 1.30E-04 | | | | 0.036 | 1.79E-05 | -3.82 | **-3.79** | 1.65E-04 | 0.015 | 2.34E-05 | -0.64 | **-0.63** | 9.60E-05 | 0.013 | 1.23E-05 | -3.49 | **-3.47** |
| | | 60" | 1.33E-04 | | | | | | | | 1.67E-04 | 0.015 | 2.33E-05 | -0.64 | **-0.63** | 9.84E-05 | 0.014 | 1.42E-05 | -3.49 | **-3.47** |
| | | 72" | | | | | | | | | 1.65E-04 | 0.016 | 2.33E-05 | -0.64 | **-0.63** | 9.77E-05 | | | | |
| | ASHRAE Climate Zone 6,7 | 36" | | | | | | | | | 1.66E-04 | 0.016 | 2.35E-05 | -0.77 | **-0.75** | 9.88E-05 | 0.012 | 1.25E-05 | -4.20 | **-4.18** |
| | | 48" | 1.30E-04 | | | | 0.036 | 1.79E-05 | -4.59 | **-4.56** | 1.65E-04 | 0.015 | 2.34E-05 | -0.77 | **-0.75** | 9.60E-05 | 0.013 | 1.23E-05 | -4.20 | **-4.18** |
| | | 60" | 1.33E-04 | | | | | | | | 1.67E-04 | 0.015 | 2.33E-05 | -0.77 | **-0.75** | 9.84E-05 | 0.014 | 1.42E-05 | -4.20 | **-4.18** |
| | | 72" | | | | | | | | | 1.65E-04 | 0.016 | 2.33E-05 | -0.77 | **-0.75** | 9.77E-05 | | | | |
| | Canada | 36" | | | | | | | | | 5.66E-04 | | | | | 3.35E-04 | 0.012 | 1.25E-05 | -0.49 | **-0.48** |
| | | 48" | 4.43E-04 | | | | 0.036 | 1.79E-05 | -0.47 | **-0.43** | 5.59E-04 | | | | | 3.27E-04 | 0.013 | 1.23E-05 | -0.49 | **-0.47** |
| | | 60" | 4.51E-04 | | | | | | | | 5.67E-04 | | | | | 3.36E-04 | 0.014 | 1.42E-05 | -0.49 | **-0.47** |
| | | 72" | | | | | | | | | 5.63E-04 | | | | | 3.30E-04 | | | | |
| | Mexico | 36" | | | | | | | | | 1.59E-04 | 0.016 | 2.35E-05 | -0.49 | **-0.47** | 9.43E-05 | 0.012 | 1.25E-05 | -2.65 | **-2.64** |
| | | 48" | | | | | | | | | 1.58E-04 | 0.015 | 2.34E-05 | -0.49 | **-0.47** | 9.26E-05 | 0.013 | 1.23E-05 | -2.65 | **-2.64** |
| | | 60" | | | | | | | | | 1.60E-04 | 0.015 | 2.33E-05 | -0.49 | **-0.47** | 9.57E-05 | 0.014 | 1.42E-05 | -2.65 | **-2.63** |
| | | 72" | | | | | | | | | 1.59E-04 | 0.016 | 2.33E-05 | -0.49 | **-0.47** | 9.32E-05 | | | | |
| Europe | France | 36" | | | | | | | | | 6.13E-03 | 0.016 | 3.13E-05 | -0.08 | **-0.06** | 3.61E-03 | 0.012 | 1.77E-05 | -0.45 | **-0.43** |
| | | 48" | | | | | | | | | 6.05E-03 | 0.015 | 3.10E-05 | -0.08 | **-0.06** | 3.55E-03 | 0.013 | 1.75E-05 | -0.45 | **-0.43** |
| | | 60" | | | | | | | | | 6.15E-03 | 0.015 | 3.12E-05 | -0.08 | **-0.06** | 3.64E-03 | 0.014 | 2.00E-05 | -0.45 | **-0.43** |
| | | 72" | | | | | | | | | 6.09E-03 | 0.016 | 3.10E-05 | -0.08 | **-0.06** | 3.58E-03 | | | | |
| | Northern Europe | 36" | | | | | | | | | 6.20E-03 | 0.016 | 2.09E-05 | -0.07 | **-0.05** | 3.67E-03 | 0.012 | 1.69E-05 | -0.44 | **-0.42** |
| | | 48" | 4.84E-03 | | | | | | | | 6.13E-03 | 0.015 | 2.02E-05 | -0.07 | **-0.05** | 3.59E-03 | 0.013 | 1.63E-05 | -0.44 | **-0.42** |
| | | 60" | 4.94E-03 | 0.032 | 1.90E-05 | -0.44 | **-0.40** | | | | 6.22E-03 | 0.015 | 2.10E-05 | -0.07 | **-0.05** | 3.68E-03 | 0.014 | 1.77E-05 | -0.44 | **-0.42** |
| | | 72" | | | | | | | | | 6.17E-03 | 0.016 | 2.05E-05 | -0.07 | **-0.05** | 3.61E-03 | | | | |
| | Russia | 36" | | | | | | | | | | | | | | 3.86E-03 | | | | |
| | | 48" | | | | | | | | | | | | | | 3.78E-03 | | | | |
| | | 60" | | | | | | | | | | | | | | 3.87E-03 | | | | |
| | | 72" | | | | | | | | | | | | | | 3.81E-03 | | | | |
| | Scandivania | 36" | | | | | | | | | 6.00E-03 | 0.016 | 5.73E-05 | -0.08 | **-0.05** | 3.55E-03 | 0.012 | 3.42E-05 | -0.45 | **-0.43** |
| | | 48" | 4.69E-03 | | | | | | | | 5.92E-03 | 0.015 | 5.67E-05 | -0.08 | **-0.05** | 3.47E-03 | 0.013 | 3.36E-05 | -0.45 | **-0.43** |
| | | 60" | 4.79E-03 | 0.032 | 4.59E-05 | -0.43 | **-0.39** | | | | 6.02E-03 | 0.015 | 5.74E-05 | -0.08 | **-0.05** | 3.56E-03 | 0.014 | 3.84E-05 | -0.45 | **-0.43** |
| | | 72" | | | | | | | | | 5.96E-03 | 0.016 | 5.70E-05 | -0.08 | **-0.05** | 3.50E-03 | | | | |
| | Southern Europe | 36" | | | | | | | | | 6.20E-03 | 0.016 | 2.09E-05 | -0.74 | **-0.71** | 3.67E-03 | | | | |
| | | 48" | | | | | | | | | 6.13E-03 | 0.015 | 2.02E-05 | -0.74 | **-0.72** | 3.59E-03 | | | | |
| | | 60" | | | | | | | | | 6.22E-03 | 0.015 | 2.10E-05 | -0.74 | **-0.71** | 3.68E-03 | | | | |
| | | 72" | | | | | | | | | 6.17E-03 | 0.016 | 2.05E-05 | -0.74 | **-0.71** | 3.63E-03 | | | | |
| | United Kingdom | 36" | | | | | | | | | 5.87E-03 | 0.016 | 2.29E-05 | -0.17 | **-0.14** | 3.48E-03 | 0.012 | 1.19E-05 | -0.93 | **-0.92** |
| | | 48" | 4.60E-03 | | | | | | | | 5.80E-03 | 0.015 | 2.28E-05 | -0.17 | **-0.15** | 3.40E-03 | 0.013 | 1.18E-05 | -0.93 | **-0.92** |
| | | 60" | 4.69E-03 | 0.032 | 1.72E-05 | -1.04 | **-1.00** | | | | 5.90E-03 | 0.015 | 2.27E-05 | -0.17 | **-0.14** | 3.48E-03 | 0.014 | 2.55E-05 | -0.93 | **-0.92** |
| | | 72" | | | | | | | | | 5.84E-03 | 0.016 | 2.27E-05 | -0.17 | **-0.14** | 3.43E-03 | | | | |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

## 9.3 Acidification potential: North America and Europe (cont.)

| Acidification Potential (kg $SO_2$-eq/$m^2$) | | CDA & OSW | TrueVue 5 | | | | TrueVue 15 | | | | TrueVue 30 | | | | TrueVue 40 | | | | Sentinel Silver 20 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Transportation to Customer | Manufacturing | End-of-life | Operational Energy | **Net kg $SO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $SO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $SO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $SO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $SO_2$-eq** |
| North America | ASHRAE Climate Zone 1,2 | 36" | 9.88E-05 | 0.014 | 1.25E-05 | -10.22 | **-10.21** | 0.014 | 1.25E-05 | -9.88 | **-9.86** | 0.013 | 1.25E-05 | -7.02 | **-7.01** | 0.013 | 1.25E-05 | -5.49 | **-5.47** | 0.013 | 1.25E-05 | -5.45 | **-5.44** |
| | | 48" | 9.60E-05 | 0.014 | 1.23E-05 | -10.22 | **-10.21** | 0.014 | 1.23E-05 | -9.88 | **-9.86** | 0.013 | 1.23E-05 | -7.02 | **-7.01** | 0.013 | 1.23E-05 | -5.49 | **-5.47** | 0.012 | 1.23E-05 | -5.45 | **-5.44** |
| | | 60" | 9.84E-05 | 0.014 | 1.23E-05 | -10.22 | **-10.21** | 0.014 | 1.23E-05 | -9.88 | **-9.86** | 0.013 | 1.23E-05 | -7.02 | **-7.01** | 0.013 | 1.23E-05 | -5.49 | **-5.47** | 0.013 | 1.23E-05 | -5.45 | **-5.44** |
| | | 72" | 9.77E-05 | 0.014 | 1.22E-05 | -10.22 | **-10.21** | 0.014 | 1.22E-05 | -9.88 | **-9.86** | 0.013 | 1.22E-05 | -7.02 | **-7.01** | 0.013 | 1.22E-05 | -5.49 | **-5.47** | 0.013 | 1.22E-05 | -5.45 | **-5.44** |
| | ASHRAE Climate Zone 3 | 36" | 9.88E-05 | 0.014 | 1.25E-05 | -8.74 | **-8.73** | 0.014 | 1.25E-05 | -8.52 | **-8.50** | 0.013 | 1.25E-05 | -6.07 | **-6.06** | 0.013 | 1.25E-05 | -4.82 | **-4.81** | 0.013 | 1.25E-05 | -5.33 | **-5.32** |
| | | 48" | 9.60E-05 | 0.014 | 1.23E-05 | -8.74 | **-8.73** | 0.014 | 1.23E-05 | -8.52 | **-8.50** | 0.013 | 1.23E-05 | -6.07 | **-6.06** | 0.013 | 1.23E-05 | -4.82 | **-4.81** | 0.012 | 1.23E-05 | -5.33 | **-5.32** |
| | | 60" | 9.84E-05 | 0.014 | 1.23E-05 | -8.74 | **-8.73** | 0.014 | 1.23E-05 | -8.52 | **-8.50** | 0.013 | 1.23E-05 | -6.07 | **-6.06** | 0.013 | 1.23E-05 | -4.82 | **-4.81** | 0.013 | 1.23E-05 | -5.33 | **-5.32** |
| | | 72" | 9.77E-05 | 0.014 | 1.22E-05 | -8.74 | **-8.73** | 0.014 | 1.22E-05 | -8.52 | **-8.50** | 0.013 | 1.22E-05 | -6.07 | **-6.06** | 0.013 | 1.22E-05 | -4.82 | **-4.81** | 0.013 | 1.22E-05 | -5.33 | **-5.32** |
| | ASHRAE Climate Zone 4 | 36" | 9.88E-05 | 0.014 | 1.25E-05 | -6.09 | **-6.08** | 0.014 | 1.25E-05 | -5.93 | **-5.91** | 0.013 | 1.25E-05 | -4.26 | **-4.25** | 0.013 | 1.25E-05 | -3.36 | **-3.35** | 0.013 | 1.25E-05 | -3.78 | **-3.77** |
| | | 48" | 9.60E-05 | 0.014 | 1.23E-05 | -6.09 | **-6.08** | 0.014 | 1.23E-05 | -5.93 | **-5.91** | 0.013 | 1.23E-05 | -4.26 | **-4.25** | 0.013 | 1.23E-05 | -3.36 | **-3.35** | 0.012 | 1.23E-05 | -3.78 | **-3.77** |
| | | 60" | 9.84E-05 | 0.014 | 1.23E-05 | -6.09 | **-6.08** | 0.014 | 1.23E-05 | -5.93 | **-5.91** | 0.013 | 1.23E-05 | -4.26 | **-4.25** | 0.013 | 1.23E-05 | -3.36 | **-3.35** | 0.013 | 1.23E-05 | -3.78 | **-3.77** |
| | | 72" | 9.77E-05 | 0.014 | 1.22E-05 | -6.09 | **-6.08** | 0.014 | 1.22E-05 | -5.93 | **-5.91** | 0.013 | 1.22E-05 | -4.26 | **-4.25** | 0.013 | 1.22E-05 | -3.36 | **-3.35** | 0.013 | 1.22E-05 | -3.78 | **-3.77** |
| | ASHRAE Climate Zone 5 | 36" | 9.88E-05 | 0.014 | 1.25E-05 | -5.48 | **-5.47** | 0.014 | 1.25E-05 | -5.35 | **-5.33** | 0.013 | 1.25E-05 | -3.87 | **-3.86** | 0.013 | 1.25E-05 | -3.08 | **-3.07** | 0.013 | 1.25E-05 | -3.39 | **-3.37** |
| | | 48" | 9.60E-05 | 0.014 | 1.23E-05 | -5.48 | **-5.47** | 0.014 | 1.23E-05 | -5.35 | **-5.33** | 0.013 | 1.23E-05 | -3.87 | **-3.86** | 0.013 | 1.23E-05 | -3.08 | **-3.07** | 0.012 | 1.23E-05 | -3.39 | **-3.38** |
| | | 60" | 9.84E-05 | 0.014 | 1.23E-05 | -5.48 | **-5.47** | 0.014 | 1.23E-05 | -5.35 | **-5.33** | 0.013 | 1.23E-05 | -3.87 | **-3.86** | 0.013 | 1.23E-05 | -3.08 | **-3.07** | 0.013 | 1.23E-05 | -3.39 | **-3.37** |
| | | 72" | 9.77E-05 | 0.014 | 1.22E-05 | -5.48 | **-5.47** | 0.014 | 1.22E-05 | -5.35 | **-5.33** | 0.013 | 1.22E-05 | -3.87 | **-3.86** | 0.013 | 1.22E-05 | -3.08 | **-3.07** | 0.013 | 1.22E-05 | -3.39 | **-3.37** |
| | ASHRAE Climate Zone 6,7 | 36" | 9.88E-05 | 0.014 | 1.25E-05 | -6.59 | **-6.57** | 0.014 | 1.25E-05 | -6.40 | **-6.39** | 0.013 | 1.25E-05 | -4.67 | **-4.66** | 0.013 | 1.25E-05 | -3.74 | **-3.73** | 0.013 | 1.25E-05 | -4.05 | **-4.03** |
| | | 48" | 9.60E-05 | 0.014 | 1.23E-05 | -6.59 | **-6.57** | 0.014 | 1.23E-05 | -6.40 | **-6.39** | 0.013 | 1.23E-05 | -4.67 | **-4.66** | 0.013 | 1.23E-05 | -3.74 | **-3.73** | 0.012 | 1.23E-05 | -4.05 | **-4.03** |
| | | 60" | 9.84E-05 | 0.014 | 1.23E-05 | -6.59 | **-6.57** | 0.014 | 1.23E-05 | -6.40 | **-6.39** | 0.013 | 1.23E-05 | -4.67 | **-4.66** | 0.013 | 1.23E-05 | -3.74 | **-3.73** | 0.013 | 1.23E-05 | -4.05 | **-4.03** |
| | | 72" | 9.77E-05 | 0.014 | 1.22E-05 | -6.59 | **-6.57** | 0.014 | 1.22E-05 | -6.40 | **-6.39** | 0.013 | 1.22E-05 | -4.67 | **-4.66** | 0.013 | 1.22E-05 | -3.74 | **-3.73** | 0.013 | 1.22E-05 | -4.05 | **-4.03** |
| | Canada | 36" | 3.35E-04 | 0.014 | 1.25E-05 | -0.66 | **-0.65** | 0.014 | 1.25E-05 | -0.65 | **-0.64** | 0.013 | 1.25E-05 | -0.48 | **-0.46** | 0.013 | 1.25E-05 | -0.38 | **-0.37** | 0.013 | 1.25E-05 | -0.38 | **-0.36** |
| | | 48" | 3.27E-04 | 0.014 | 1.23E-05 | -0.66 | **-0.65** | 0.014 | 1.23E-05 | -0.65 | **-0.64** | 0.013 | 1.23E-05 | -0.48 | **-0.46** | 0.013 | 1.23E-05 | -0.38 | **-0.37** | 0.012 | 1.23E-05 | -0.38 | **-0.36** |
| | | 60" | 3.36E-04 | 0.014 | 1.23E-05 | -0.66 | **-0.65** | 0.014 | 1.23E-05 | -0.65 | **-0.64** | 0.013 | 1.23E-05 | -0.48 | **-0.46** | 0.013 | 1.23E-05 | -0.38 | **-0.37** | 0.013 | 1.23E-05 | -0.38 | **-0.36** |
| | | 72" | 3.30E-04 | 0.014 | 1.22E-05 | -0.66 | **-0.65** | 0.014 | 1.22E-05 | -0.65 | **-0.64** | 0.013 | 1.22E-05 | -0.48 | **-0.46** | 0.013 | 1.22E-05 | -0.38 | **-0.37** | 0.013 | 1.22E-05 | -0.38 | **-0.36** |
| | Mexico | 36" | 9.43E-05 | | | | | | | | | | | | | | | | | 0.013 | 1.25E-05 | -2.71 | **-2.70** |
| | | 48" | 9.26E-05 | | | | | | | | | | | | | | | | | 0.012 | 1.23E-05 | -2.71 | **-2.70** |
| | | 60" | 9.57E-05 | | | | | | | | | | | | | | | | | 0.013 | 1.23E-05 | -2.71 | **-2.70** |
| | | 72" | 9.32E-05 | | | | | | | | | | | | | | | | | 0.013 | 1.22E-05 | -2.71 | **-2.70** |
| Europe | France | 36" | 3.61E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.77E-05 | -0.43 | **-0.41** |
| | | 48" | 3.55E-03 | | | | | | | | | | | | | | | | | 0.012 | 1.75E-05 | -0.43 | **-0.42** |
| | | 60" | 3.64E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.76E-05 | -0.43 | **-0.41** |
| | | 72" | 3.58E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.75E-05 | -0.43 | **-0.41** |
| | Northern Europe | 36" | 3.67E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.69E-05 | -0.37 | **-0.35** |
| | | 48" | 3.59E-03 | | | | | | | | | | | | | | | | | 0.012 | 1.63E-05 | -0.37 | **-0.35** |
| | | 60" | 3.68E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.70E-05 | -0.37 | **-0.35** |
| | | 72" | 3.61E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.66E-05 | -0.37 | **-0.35** |
| | Russia | 36" | 3.86E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.25E-05 | -0.45 | **-0.44** |
| | | 48" | 3.78E-03 | | | | | | | | | | | | | | | | | 0.012 | 1.23E-05 | -0.45 | **-0.44** |
| | | 60" | 3.87E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.23E-05 | -0.45 | **-0.44** |
| | | 72" | 3.81E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.22E-05 | -0.45 | **-0.44** |
| | Scandivania | 36" | 3.55E-03 | 0.014 | 3.42E-05 | -0.59 | **-0.57** | 0.014 | 3.42E-05 | -0.59 | **-0.57** | | | | | | | | | 0.013 | 3.42E-05 | -0.36 | **-0.34** |
| | | 48" | 3.47E-03 | 0.014 | 3.36E-05 | -0.59 | **-0.57** | 0.014 | 3.36E-05 | -0.59 | **-0.57** | | | | | | | | | 0.012 | 3.36E-05 | -0.36 | **-0.34** |
| | | 60" | 3.56E-03 | 0.014 | 3.43E-05 | -0.59 | **-0.57** | 0.014 | 3.43E-05 | -0.59 | **-0.57** | | | | | | | | | 0.013 | 3.43E-05 | -0.36 | **-0.34** |
| | | 72" | 3.50E-03 | 0.014 | 3.39E-05 | -0.59 | **-0.57** | 0.014 | 3.39E-05 | -0.59 | **-0.57** | | | | | | | | | 0.013 | 3.39E-05 | -0.36 | **-0.34** |
| | Southern Europe | 36" | 3.67E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.69E-05 | -4.02 | **-4.01** |
| | | 48" | 3.59E-03 | | | | | | | | | | | | | | | | | 0.012 | 1.63E-05 | -4.02 | **-4.01** |
| | | 60" | 3.68E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.70E-05 | -4.02 | **-4.01** |
| | | 72" | 3.63E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.66E-05 | -4.02 | **-4.01** |
| | United Kingdom | 36" | 3.48E-03 | 0.014 | 1.19E-05 | -1.49 | **-1.47** | 0.014 | 1.19E-05 | -1.45 | **-1.44** | 0.013 | 1.19E-05 | -1.06 | **-1.05** | 0.013 | 1.19E-05 | -0.84 | **-0.82** | 0.013 | 1.19E-05 | -0.94 | **-0.93** |
| | | 48" | 3.40E-03 | 0.014 | 1.18E-05 | -1.49 | **-1.47** | 0.014 | 1.18E-05 | -1.45 | **-1.44** | 0.013 | 1.18E-05 | -1.06 | **-1.05** | 0.013 | 1.18E-05 | -0.84 | **-0.82** | 0.012 | 1.18E-05 | -0.94 | **-0.93** |
| | | 60" | 3.48E-03 | 0.014 | 1.17E-05 | -1.49 | **-1.47** | 0.014 | 1.17E-05 | -1.45 | **-1.44** | 0.013 | 1.17E-05 | -1.06 | **-1.05** | 0.013 | 1.17E-05 | -0.84 | **-0.82** | 0.013 | 1.17E-05 | -0.94 | **-0.93** |
| | | 72" | 3.43E-03 | 0.014 | 1.17E-05 | -1.49 | **-1.47** | 0.014 | 1.17E-05 | -1.45 | **-1.44** | 0.013 | 1.17E-05 | -1.06 | **-1.05** | 0.013 | 1.17E-05 | -0.84 | **-0.82** | 0.013 | 1.17E-05 | -0.94 | **-0.93** |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

## 9.3 Acidification potential: North America and Europe (cont.)

| Acidification Potential (kg $SO_2$-eq/$m^2$) | | CDA & OSW Transportation to Customer | Sentinel Silver 35 | | | | Sentinel Stainless Steel 15 | | | | Sentinel Stainless Steel 25 | | | | Sentinel Stainless Steel 40 | | | | Sentinel Stainless Steel 45 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Manufacturing | End-of-life | Operational Energy | **Net kg $SO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $SO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $SO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $SO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $SO_2$-eq** |
| North America | ASHRAE Climate Zone 1,2 | 36" 9.88E-05 | | | | | | | | | | | | | | | | | | | | |
| | | 48" 9.60E-05 | 0.012 | 1.23E-05 | -4.30 | **-4.29** | | | | | | | | | | | | | | | | |
| | | 60" 9.84E-05 | 0.013 | 1.23E-05 | -4.30 | **-4.29** | 0.013 | 1.23E-05 | -4.76 | **-4.75** | 0.013 | 1.23E-05 | -3.99 | **-3.98** | 0.013 | 1.23E-05 | -2.97 | **-2.96** | 0.013 | 1.23E-05 | -2.53 | **-2.52** |
| | | 72" 9.77E-05 | 0.013 | 1.22E-05 | -4.30 | **-4.29** | 0.013 | 1.22E-05 | -4.76 | **-4.75** | 0.013 | 1.22E-05 | -3.99 | **-3.98** | 0.013 | 1.22E-05 | -2.97 | **-2.96** | 0.013 | 1.22E-05 | -2.53 | **-2.52** |
| | ASHRAE Climate Zone 3 | 36" 9.88E-05 | | | | | | | | | | | | | | | | | | | | |
| | | 48" 9.60E-05 | 0.012 | 1.23E-05 | -4.49 | **-4.48** | | | | | | | | | | | | | | | | |
| | | 60" 9.84E-05 | 0.013 | 1.23E-05 | -4.49 | **-4.48** | 0.013 | 1.23E-05 | -5.04 | **-5.03** | 0.013 | 1.23E-05 | -4.35 | **-4.33** | 0.013 | 1.23E-05 | -3.39 | **-3.38** | 0.013 | 1.23E-05 | -2.98 | **-2.97** |
| | | 72" 9.77E-05 | 0.013 | 1.22E-05 | -4.49 | **-4.48** | 0.013 | 1.22E-05 | -5.04 | **-5.03** | 0.013 | 1.22E-05 | -4.35 | **-4.33** | 0.013 | 1.22E-05 | -3.39 | **-3.38** | 0.013 | 1.22E-05 | -2.98 | **-2.97** |
| | ASHRAE Climate Zone 4 | 36" 9.88E-05 | | | | | | | | | | | | | | | | | | | | |
| | | 48" 9.60E-05 | 0.012 | 1.23E-05 | -3.11 | **-3.10** | | | | | | | | | | | | | | | | |
| | | 60" 9.84E-05 | 0.013 | 1.23E-05 | -3.11 | **-3.10** | 0.013 | 1.23E-05 | -3.48 | **-3.47** | 0.013 | 1.23E-05 | -3.02 | **-3.00** | 0.013 | 1.23E-05 | -2.37 | **-2.36** | 0.013 | 1.23E-05 | -2.09 | **-2.08** |
| | | 72" 9.77E-05 | 0.013 | 1.22E-05 | -3.11 | **-3.10** | 0.013 | 1.22E-05 | -3.48 | **-3.47** | 0.013 | 1.22E-05 | -3.02 | **-3.00** | 0.013 | 1.22E-05 | -2.37 | **-2.36** | 0.013 | 1.22E-05 | -2.09 | **-2.08** |
| | ASHRAE Climate Zone 5 | 36" 9.88E-05 | | | | | | | | | | | | | | | | | | | | |
| | | 48" 9.60E-05 | 0.012 | 1.23E-05 | -2.80 | **-2.79** | | | | | | | | | | | | | | | | |
| | | 60" 9.84E-05 | 0.013 | 1.23E-05 | -2.80 | **-2.79** | 0.013 | 1.23E-05 | -3.13 | **-3.11** | 0.013 | 1.23E-05 | -2.72 | **-2.71** | 0.013 | 1.23E-05 | -2.16 | **-2.15** | 0.013 | 1.23E-05 | -1.91 | **-1.90** |
| | | 72" 9.77E-05 | 0.013 | 1.22E-05 | -2.80 | **-2.79** | 0.013 | 1.22E-05 | -3.13 | **-3.11** | 0.013 | 1.22E-05 | -2.72 | **-2.71** | 0.013 | 1.22E-05 | -2.16 | **-2.15** | 0.013 | 1.22E-05 | -1.91 | **-1.90** |
| | ASHRAE Climate Zone 6,7 | 36" 9.88E-05 | | | | | | | | | | | | | | | | | | | | |
| | | 48" 9.60E-05 | 0.012 | 1.23E-05 | -3.36 | **-3.35** | | | | | | | | | | | | | | | | |
| | | 60" 9.84E-05 | 0.013 | 1.23E-05 | -3.36 | **-3.35** | 0.013 | 1.23E-05 | -3.74 | **-3.73** | 0.013 | 1.23E-05 | -3.26 | **-3.25** | 0.013 | 1.23E-05 | -2.58 | **-2.57** | 0.013 | 1.23E-05 | -2.28 | **-2.27** |
| | | 72" 9.77E-05 | 0.013 | 1.22E-05 | -3.36 | **-3.35** | 0.013 | 1.22E-05 | -3.74 | **-3.73** | 0.013 | 1.22E-05 | -3.26 | **-3.25** | 0.013 | 1.22E-05 | -2.58 | **-2.57** | 0.013 | 1.22E-05 | -2.28 | **-2.27** |
| | Canada | 36" 3.35E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 48" 3.27E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 60" 3.36E-04 | | | | | 0.013 | 1.23E-05 | -0.36 | **-0.35** | 0.013 | 1.23E-05 | -0.32 | **-0.31** | 0.013 | 1.23E-05 | -0.26 | **-0.25** | 0.013 | 1.23E-05 | -0.23 | **-0.22** |
| | | 72" 3.30E-04 | | | | | 0.013 | 1.22E-05 | -0.36 | **-0.35** | 0.013 | 1.22E-05 | -0.32 | **-0.31** | 0.013 | 1.22E-05 | -0.26 | **-0.25** | 0.013 | 1.22E-05 | -0.23 | **-0.22** |
| | Mexico | 36" 9.43E-05 | | | | | | | | | | | | | | | | | | | | |
| | | 48" 9.26E-05 | 0.012 | 1.23E-05 | -2.21 | **-2.20** | | | | | | | | | | | | | | | | |
| | | 60" 9.57E-05 | 0.013 | 1.23E-05 | -2.21 | **-2.20** | | | | | | | | | | | | | 0.013 | 1.23E-05 | -1.47 | **-1.45** |
| | | 72" 9.32E-05 | 0.013 | 1.22E-05 | -2.21 | **-2.20** | | | | | | | | | | | | | 0.013 | 1.22E-05 | -1.47 | **-1.45** |
| Europe | France | 36" 3.61E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 48" 3.55E-03 | 0.012 | 1.75E-05 | -0.35 | **-0.34** | | | | | | | | | | | | | | | | |
| | | 60" 3.64E-03 | 0.013 | 1.76E-05 | -0.35 | **-0.34** | 0.013 | 1.76E-05 | -0.40 | **-0.38** | 0.013 | 1.76E-05 | -0.34 | **-0.33** | 0.013 | 1.76E-05 | -0.27 | **-0.25** | 0.013 | 1.76E-05 | -0.24 | **-0.22** |
| | | 72" 3.58E-03 | 0.013 | 1.75E-05 | -0.35 | **-0.34** | 0.013 | 1.75E-05 | -0.40 | **-0.38** | 0.013 | 1.75E-05 | -0.34 | **-0.33** | 0.013 | 1.75E-05 | -0.27 | **-0.25** | 0.013 | 1.75E-05 | -0.24 | **-0.22** |
| | Northern Europe | 36" 3.67E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 48" 3.59E-03 | 0.012 | 1.63E-05 | -0.30 | **-0.29** | | | | | | | | | | | | | | | | |
| | | 60" 3.68E-03 | 0.013 | 1.77E-05 | -0.30 | **-0.29** | 0.013 | 1.70E-05 | -0.34 | **-0.33** | 0.013 | 1.70E-05 | -0.31 | **-0.29** | 0.013 | 1.70E-05 | -0.24 | **-0.23** | 0.013 | 1.70E-05 | -0.22 | **-0.20** |
| | | 72" 3.61E-03 | 0.013 | 1.66E-05 | -0.30 | **-0.29** | 0.013 | 1.66E-05 | -0.34 | **-0.33** | 0.013 | 1.66E-05 | -0.31 | **-0.29** | 0.013 | 1.66E-05 | -0.24 | **-0.23** | 0.013 | 1.66E-05 | -0.22 | **-0.20** |
| | Russia | 36" 3.86E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 48" 3.78E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 60" 3.87E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 72" 3.81E-03 | | | | | | | | | | | | | | | | | | | | |
| | Scandivania | 36" 3.55E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 48" 3.47E-03 | 0.012 | 3.36E-05 | -0.31 | **-0.29** | | | | | | | | | | | | | | | | |
| | | 60" 3.56E-03 | 0.013 | 3.43E-05 | -0.31 | **-0.29** | 0.013 | 3.43E-05 | -0.34 | **-0.32** | 0.013 | 3.43E-05 | -0.30 | **-0.28** | 0.013 | 3.43E-05 | -0.24 | **-0.22** | 0.013 | 3.43E-05 | -0.21 | **-0.19** |
| | | 72" 3.50E-03 | 0.013 | 3.39E-05 | -0.31 | **-0.29** | 0.013 | 3.39E-05 | -0.34 | **-0.32** | 0.013 | 3.39E-05 | -0.30 | **-0.28** | 0.013 | 2.54E-05 | -0.24 | **-0.22** | 0.013 | 3.39E-05 | -0.21 | **-0.19** |
| | Southern Europe | 36" 3.67E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 48" 3.59E-03 | 0.012 | 1.63E-05 | -3.30 | **-3.28** | | | | | | | | | | | | | | | | |
| | | 60" 3.68E-03 | 0.013 | 1.70E-05 | -3.30 | **-3.28** | 0.013 | 1.70E-05 | -3.69 | **-3.67** | 0.013 | 1.70E-05 | -3.19 | **-3.18** | 0.013 | 1.70E-05 | -2.50 | **-2.48** | 0.013 | 1.70E-05 | -2.20 | **-2.19** |
| | | 72" 3.63E-03 | 0.013 | 1.66E-05 | -3.30 | **-3.28** | 0.013 | 1.66E-05 | -3.69 | **-3.67** | 0.013 | 1.66E-05 | -3.19 | **-3.18** | 0.013 | 1.66E-05 | -2.50 | **-2.49** | 0.013 | 1.66E-05 | -2.20 | **-2.19** |
| | United Kingdom | 36" 3.48E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 48" 3.40E-03 | 0.012 | 1.18E-05 | -0.77 | **-0.75** | | | | | | | | | | | | | | | | |
| | | 60" 3.48E-03 | 0.013 | 1.17E-05 | -0.77 | **-0.75** | 0.013 | 1.17E-05 | -0.87 | **-0.85** | 0.013 | 1.17E-05 | -0.73 | **-0.72** | 0.013 | 1.17E-05 | -0.60 | **-0.58** | 0.013 | 1.17E-05 | -0.52 | **-0.51** |
| | | 72" 3.43E-03 | 0.013 | 1.17E-05 | -0.77 | **-0.75** | 0.013 | 1.17E-05 | -0.87 | **-0.85** | 0.013 | 2.31E-05 | -0.73 | **-0.72** | 0.013 | 1.17E-05 | -0.60 | **-0.58** | 0.013 | 1.17E-05 | -0.52 | **-0.51** |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

## 9.3 Acidification potential: Asia and South America

| Acidification Potential ($kg\ SO_2$-eq/$m^2$) | | PS Series | LX 40 | | | | Hilite 40 | | | | 4 Mil Clear | Sentinel 4 Mil Clear | | | | CDA & OSW | Silver AG 50 Low-E | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Transportation to Customer | Manufacturing | End-of-life | Operational Energy | **Net kg $SO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $SO_2$-eq** | Transportation to Customer | Manufacturing | End-of-life | Operational Energy | **Net kg $SO_2$-eq** | Transportation to Customer | Manufacturing | End-of-life | Operational Energy | **Net kg $SO_2$-eq** |
| Asia and Pacific | Australia 36" | | | | | | | | | | 8.37E-03 | 0.016 | 2.35E-05 | -0.72 | **-0.69** | 4.95E-03 | 0.012 | 1.25E-05 | -3.84 | **-3.82** |
| | Australia 48" | | | | | | | | | | 8.26E-03 | 0.015 | 2.34E-05 | -0.72 | **-0.70** | 4.85E-03 | 0.013 | 1.23E-05 | -3.84 | **-3.82** |
| | Australia 60" | | | | | | | | | | 8.39E-03 | 0.015 | 2.33E-05 | -0.72 | **-0.69** | 4.96E-03 | 0.014 | 1.42E-05 | -3.84 | **-3.82** |
| | Australia 72" | | | | | | | | | | 8.32E-03 | 0.016 | 2.33E-05 | -0.72 | **-0.69** | 4.89E-03 | | | | |
| | China, Mid-East Coast 36" | | | | | | | | | | 6.76E-03 | | | | | 3.99E-03 | | | | |
| | China, Mid-East Coast 48" | 5.28E-03 | | | | | | | | | 6.68E-03 | | | | | 3.91E-03 | | | | |
| | China, Mid-East Coast 60" | 4.69E-03 | | | | | | | | | 6.78E-03 | | | | | 4.02E-03 | | | | |
| | China, Mid-East Coast 72" | | | | | | | | | | 6.71E-03 | | | | | 3.95E-03 | | | | |
| | North-East Asia 36" | | | | | | | | | | 6.76E-03 | | | | | 3.99E-03 | 0.012 | 1.25E-05 | -9.12 | **-9.10** |
| | North-East Asia 48" | 5.28E-03 | | | | | | | | | 6.68E-03 | | | | | 3.91E-03 | 0.013 | 1.23E-05 | -9.12 | **-9.10** |
| | North-East Asia 60" | 4.69E-03 | | | | | | | | | 6.78E-03 | | | | | 4.02E-03 | 0.014 | 1.42E-05 | -9.12 | **-9.10** |
| | North-East Asia 72" | | | | | | | | | | 6.71E-03 | | | | | 3.95E-03 | | | | |
| | China, South-East 36" | | | | | | | | | | | | | | | 3.99E-03 | | | | |
| | China, South-East 48" | 5.28E-03 | | | | | | | | | | | | | | 3.91E-03 | | | | |
| | China, South-East 60" | 4.69E-03 | | | | | | | | | | | | | | 4.02E-03 | | | | |
| | China, South-East 72" | | | | | | | | | | | | | | | 3.95E-03 | | | | |
| | India 36" | | | | | | | | | | | | | | | | | | | |
| | India 48" | 6.73E-03 | | | | | | | | | | | | | | | | | | |
| | India 60" | 6.86E-03 | | | | | | | | | | | | | | | | | | |
| | India 72" | | | | | | | | | | | | | | | | | | | |
| | Japan 36" | | | | | | | | | | | | | | | 3.50E-03 | | | | |
| | Japan 48" | | | | | | | | | | | | | | | 3.43E-03 | | | | |
| | Japan 60" | | | | | | | | | | | | | | | 3.51E-03 | | | | |
| | Japan 72" | | | | | | | | | | | | | | | 3.45E-03 | | | | |
| | Malaysia 36" | | | | | | | | | | | | | | | 5.36E-03 | | | | |
| | Malaysia 48" | 7.10E-03 | | | | | | | | | | | | | | 5.25E-03 | | | | |
| | Malaysia 60" | 7.23E-03 | | | | | | | | | | | | | | 5.38E-03 | | | | |
| | Malaysia 72" | | | | | | | | | | | | | | | 5.25E-03 | | | | |
| | Middle East 36" | | | | | | | | | | | | | | | 5.23E-03 | 0.012 | 1.25E-05 | -4.72 | **-4.71** |
| | Middle East 48" | 6.92E-03 | | | | | | | | | | | | | | 5.12E-03 | 0.013 | 1.23E-05 | -4.72 | **-4.70** |
| | Middle East 60" | 7.05E-03 | | | | | | | | | | | | | | 5.25E-03 | 0.014 | 1.42E-05 | -4.72 | **-4.70** |
| | Middle East 72" | | | | | | | | | | | | | | | 5.16E-03 | | | | |
| | Turkey 36" | | | | | | | | | | | | | | | 4.44E-03 | | | | |
| | Turkey 48" | 5.87E-03 | | | | | | | | | | | | | | 4.34E-03 | | | | |
| | Turkey 60" | 5.99E-03 | | | | | | | | | | | | | | 4.45E-03 | | | | |
| | Turkey 72" | | | | | | | | | | | | | | | 4.38E-03 | | | | |
| South America | Argentina 36" | | | | | | | | | | | | | | | 3.75E-03 | | | | |
| | Argentina 48" | 4.97E-03 | | | | | | | | | | | | | | 3.68E-03 | | | | |
| | Argentina 60" | 5.07E-03 | | | | | | | | | | | | | | 3.77E-03 | | | | |
| | Argentina 72" | | | | | | | | | | | | | | | 3.71E-03 | | | | |
| | Brazil 36" | | | | | | | | | | | | | | | 3.54E-03 | | | | |
| | Brazil 48" | 4.70E-03 | | | | | | | | | | | | | | 3.48E-03 | | | | |
| | Brazil 60" | 4.79E-03 | 0.032 | 1.78E-05 | -0.41 | **-0.38** | | | | | | | | | | 3.57E-03 | | | | |
| | Brazil 72" | | | | | | | | | | | | | | | 3.50E-03 | | | | |
| | Venezuela 36" | | | | | | | | | | | | | | | 2.21E-03 | | | | |
| | Venezuela 48" | | | | | | | | | | | | | | | 2.17E-03 | | | | |
| | Venezuela 60" | | | | | | | | | | | | | | | 2.23E-03 | | | | |
| | Venezuela 72" | | | | | | | | | | | | | | | 2.19E-03 | | | | |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

## 9.3 Acidification potential: Asia and South America (cont.)

| Acidification Potential ($kg\ SO_2$-eq/$m^2$) | | CDA & OSW | TrueVue 5 | | | | TrueVue 15 | | | | TrueVue 30 | | | | TrueVue 40 | | | | Sentinel Silver 20 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Transportation to Customer | Manufacturing | End-of-life | Operational Energy | **Net kg $SO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $SO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $SO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $SO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $SO_2$-eq** |
| Asia and Pacific | Australia 36" | 4.95E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.25E-05 | -3.95 | **-3.93** |
| | Australia 48" | 4.85E-03 | | | | | | | | | | | | | | | | | 0.012 | 1.23E-05 | -3.95 | **-3.93** |
| | Australia 60" | 4.96E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.23E-05 | -3.95 | **-3.93** |
| | Australia 72" | 4.89E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.22E-05 | -3.95 | **-3.93** |
| | China, Mid-East Coast 36" | 3.99E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.25E-05 | -7.80 | **-7.78** |
| | China, Mid-East Coast 48" | 3.91E-03 | | | | | | | | | | | | | | | | | 0.012 | 1.23E-05 | -7.80 | **-7.78** |
| | China, Mid-East Coast 60" | 4.02E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.23E-05 | -7.80 | **-7.78** |
| | China, Mid-East Coast 72" | 3.95E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.22E-05 | -7.80 | **-7.78** |
| | North-East Asia 36" | 3.99E-03 | 0.014 | 1.25E-05 | -14.27 | **-14.25** | 0.014 | 1.25E-05 | -13.85 | **-13.83** | 0.013 | 1.25E-05 | -10.04 | **-10.02** | 0.013 | 1.25E-05 | -8.01 | **-7.99** | | | | |
| | North-East Asia 48" | 3.91E-03 | 0.014 | 1.23E-05 | -14.27 | **-14.25** | 0.014 | 1.23E-05 | -13.85 | **-13.83** | 0.013 | 1.23E-05 | -10.04 | **-10.02** | 0.013 | 1.23E-05 | -8.01 | **-7.99** | | | | |
| | North-East Asia 60" | 4.02E-03 | 0.014 | 1.23E-05 | -14.27 | **-14.25** | 0.014 | 1.23E-05 | -13.85 | **-13.83** | 0.013 | 1.23E-05 | -10.04 | **-10.02** | 0.013 | 1.23E-05 | -8.01 | **-7.99** | | | | |
| | North-East Asia 72" | 3.95E-03 | 0.014 | 1.22E-05 | -14.27 | **-14.25** | 0.014 | 1.22E-05 | -13.85 | **-13.83** | 0.013 | 1.22E-05 | -10.04 | **-10.02** | 0.013 | 1.22E-05 | -8.01 | **-7.99** | | | | |
| | China, South-East 36" | 3.99E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.25E-05 | -10.02 | **-10.00** |
| | China, South-East 48" | 3.91E-03 | | | | | | | | | | | | | | | | | 0.012 | 1.23E-05 | -10.02 | **-10.00** |
| | China, South-East 60" | 4.02E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.23E-05 | -10.02 | **-10.00** |
| | China, South-East 72" | 3.95E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.22E-05 | -10.02 | **-10.00** |
| | India 36" | | | | | | | | | | | | | | | | | | | | | |
| | India 48" | | | | | | | | | | | | | | | | | | | | | |
| | India 60" | | | | | | | | | | | | | | | | | | | | | |
| | India 72" | | | | | | | | | | | | | | | | | | | | | |
| | Japan 36" | 3.50E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.25E-05 | -1.38 | **-1.36** |
| | Japan 48" | 3.43E-03 | | | | | | | | | | | | | | | | | 0.012 | 1.23E-05 | -1.38 | **-1.36** |
| | Japan 60" | 3.51E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.23E-05 | -1.38 | **-1.36** |
| | Japan 72" | 3.45E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.22E-05 | -1.38 | **-1.36** |
| | Malaysia 36" | 5.36E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.25E-05 | -2.92 | **-2.90** |
| | Malaysia 48" | 5.25E-03 | | | | | | | | | | | | | | | | | 0.012 | 1.23E-05 | -2.92 | **-2.90** |
| | Malaysia 60" | 5.38E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.23E-05 | -2.92 | **-2.90** |
| | Malaysia 72" | 5.25E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.19E-05 | -2.92 | **-2.90** |
| | Middle East 36" | 5.23E-03 | 0.014 | 1.25E-05 | -7.52 | **-7.50** | 0.014 | 1.25E-05 | -7.27 | **-7.25** | 0.013 | 1.25E-05 | -5.17 | **-5.15** | 0.013 | 1.25E-05 | -4.03 | **-4.01** | 0.013 | 1.25E-05 | -4.02 | **-4.00** |
| | Middle East 48" | 5.12E-03 | 0.014 | 1.23E-05 | -7.52 | **-7.50** | 0.014 | 1.23E-05 | -7.27 | **-7.25** | 0.013 | 1.23E-05 | -5.17 | **-5.15** | 0.013 | 1.23E-05 | -4.03 | **-4.01** | 0.012 | 1.23E-05 | -4.02 | **-4.00** |
| | Middle East 60" | 5.25E-03 | 0.014 | 1.23E-05 | -7.52 | **-7.50** | 0.014 | 1.23E-05 | -7.27 | **-7.25** | 0.013 | 1.23E-05 | -5.17 | **-5.15** | 0.013 | 1.23E-05 | -4.03 | **-4.01** | 0.013 | 1.23E-05 | -4.02 | **-4.00** |
| | Middle East 72" | 5.16E-03 | 0.014 | 1.22E-05 | -7.52 | **-7.50** | 0.014 | 1.22E-05 | -7.27 | **-7.25** | 0.013 | 1.22E-05 | -5.17 | **-5.15** | 0.013 | 1.22E-05 | -4.03 | **-4.01** | 0.013 | 1.22E-05 | -4.02 | **-4.00** |
| | Turkey 36" | 4.44E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.25E-05 | -2.28 | **-2.26** |
| | Turkey 48" | 4.34E-03 | | | | | | | | | | | | | | | | | 0.012 | 1.23E-05 | -2.28 | **-2.26** |
| | Turkey 60" | 4.45E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.23E-05 | -2.28 | **-2.26** |
| | Turkey 72" | 4.38E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.22E-05 | -2.28 | **-2.26** |
| South America | Argentina 36" | 3.75E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.25E-05 | -1.02 | **-1.01** |
| | Argentina 48" | 3.68E-03 | | | | | | | | | | | | | | | | | 0.012 | 1.23E-05 | -1.02 | **-1.01** |
| | Argentina 60" | 3.77E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.23E-05 | -1.02 | **-1.01** |
| | Argentina 72" | 3.71E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.22E-05 | -1.02 | **-1.01** |
| | Brazil 36" | 3.54E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.25E-05 | -0.33 | **-0.32** |
| | Brazil 48" | 3.48E-03 | | | | | | | | | | | | | | | | | 0.012 | 1.23E-05 | -0.33 | **-0.32** |
| | Brazil 60" | 3.57E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.23E-05 | -0.33 | **-0.32** |
| | Brazil 72" | 3.50E-03 | | | | | | | | | | | | | | | | | 0.013 | 1.22E-05 | -0.33 | **-0.32** |
| | Venezuela 36" | 2.21E-03 | 0.014 | 1.25E-05 | -0.71 | **-0.70** | 0.014 | 1.25E-05 | -0.69 | **-0.68** | | | | | | | | | 0.013 | 1.25E-05 | -0.45 | **-0.44** |
| | Venezuela 48" | 2.17E-03 | 0.014 | 1.23E-05 | -0.71 | **-0.70** | 0.015 | 1.23E-05 | -0.69 | **-0.68** | | | | | | | | | 0.012 | 1.23E-05 | -0.45 | **-0.44** |
| | Venezuela 60" | 2.23E-03 | 0.014 | 1.23E-05 | -0.71 | **-0.70** | 0.014 | 1.23E-05 | -0.69 | **-0.68** | | | | | | | | | 0.013 | 1.23E-05 | -0.45 | **-0.44** |
| | Venezuela 72" | 2.19E-03 | 0.014 | 1.22E-05 | -0.71 | **-0.70** | 0.014 | 1.22E-05 | -0.69 | **-0.68** | | | | | | | | | 0.013 | 1.22E-05 | -0.45 | **-0.44** |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

## 9.3 Acidification potential: Asia and South America (cont.)

| Acidification Potential (kg $SO_2$-eq/$m^2$) | | | CDA & OSW Transportation to Customer | Sentinel Silver 35 | | | | Sentinel Stainless Steel 15 | | | | Sentinel Stainless Steel 25 | | | | Sentinel Stainless Steel 40 | | | | Sentinel Stainless Steel 45 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Manufacturing | End-of-life | Operational Energy | **Net kg $SO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $SO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $SO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $SO_2$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $SO_2$-eq** |
| Asia and Pacific | Australia | 36" | 4.95E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 4.85E-03 | 0.014 | 1.23E-05 | -3.22 | **-3.20** | | | | | | | | | | | | | | | | |
| | | 60" | 4.96E-03 | 0.013 | 1.23E-05 | -3.22 | **-3.20** | | | | | 0.013 | 1.23E-05 | -3.12 | **-3.10** | 0.013 | 1.23E-05 | -2.44 | **-2.43** | | | | |
| | | 72" | 4.89E-03 | 0.013 | 1.22E-05 | -3.22 | **-3.20** | | | | | 0.013 | 1.22E-05 | -3.12 | **-3.10** | 0.013 | 1.22E-05 | -2.44 | **-2.43** | | | | |
| | China, Mid-East Coast | 36" | 3.99E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 3.91E-03 | 0.012 | 1.23E-05 | -6.35 | **-6.33** | | | | | | | | | | | | | | | | |
| | | 60" | 4.02E-03 | 0.013 | 1.23E-05 | -6.35 | **-6.33** | 0.013 | 1.23E-05 | -7.12 | **-7.10** | 0.013 | 1.23E-05 | -6.18 | **-6.16** | | | | | | | | |
| | | 72" | 3.95E-03 | 0.013 | 1.22E-05 | -6.35 | **-6.33** | 0.013 | 1.22E-05 | -7.12 | **-7.10** | 0.013 | 1.22E-05 | -6.18 | **-6.16** | | | | | | | | |
| | North-East Asia | 36" | 3.99E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 3.91E-03 | 0.012 | 1.23E-05 | -7.29 | **-7.27** | | | | | | | | | | | | | | | | |
| | | 60" | 4.02E-03 | | | | | 0.013 | 1.23E-05 | -8.13 | **-8.11** | 0.013 | 1.23E-05 | -7.05 | **-7.04** | | | | | | | | |
| | | 72" | 3.95E-03 | | | | | 0.013 | 1.22E-05 | -8.13 | **-8.11** | 0.013 | 1.22E-05 | -7.05 | **-7.04** | | | | | | | | |
| | China, South-East | 36" | 3.99E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 3.91E-03 | 0.012 | 1.23E-05 | -7.85 | **-7.83** | | | | | | | | | | | | | | | | |
| | | 60" | 4.02E-03 | 0.013 | 1.23E-05 | -7.85 | **-7.83** | | | | | | | | | | | | | | | | |
| | | 72" | 3.95E-03 | 0.013 | 1.22E-05 | -7.85 | **-7.83** | | | | | | | | | | | | | | | | |
| | India | 36" | | | | | | | | | | | | | | | | | | | | | |
| | | 48" | | | | | | | | | | | | | | | | | | | | | |
| | | 60" | | | | | | | | | | | | | | | | | | | | | |
| | | 72" | | | | | | | | | | | | | | | | | | | | | |
| | Japan | 36" | 3.50E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 3.43E-03 | 0.012 | 1.23E-05 | -1.13 | **-1.11** | | | | | | | | | | | | | | | | |
| | | 60" | 3.51E-03 | 0.013 | 1.23E-05 | -1.13 | **-1.11** | | | | | | | | | | | | | | | | |
| | | 72" | 3.45E-03 | 0.013 | 1.22E-05 | -1.13 | **-1.11** | | | | | | | | | | | | | | | | |
| | Malaysia | 36" | 5.36E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 5.25E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 60" | 5.38E-03 | | | | | 0.013 | 1.23E-05 | -2.65 | **-2.63** | | | | | | | | | | | | |
| | | 72" | 5.25E-03 | | | | | 0.013 | 1.22E-05 | -2.65 | **-2.63** | | | | | | | | | | | | |
| | Middle East | 36" | 5.23E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 5.12E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 60" | 5.25E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 72" | 5.16E-03 | | | | | | | | | | | | | | | | | | | | |
| | Turkey | 36" | 4.44E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 4.34E-03 | 0.012 | 1.23E-05 | -1.87 | **-1.86** | | | | | | | | | | | | | | | | |
| | | 60" | 4.45E-03 | 0.013 | 1.23E-05 | -1.87 | **-1.86** | | | | | | | | | | | | | | | | |
| | | 72" | 4.38E-03 | 0.013 | 1.22E-05 | -1.87 | **-1.86** | | | | | | | | | | | | | | | | |
| South America | Argentina | 36" | 3.75E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 3.68E-03 | 0.012 | 1.23E-05 | -0.83 | **-0.82** | | | | | | | | | | | | | | | | |
| | | 60" | 3.77E-03 | 0.013 | 1.23E-05 | -0.83 | **-0.82** | 0.013 | 1.23E-05 | -0.93 | **-0.92** | | | | | | | | | 0.013 | 1.23E-05 | -0.55 | **-0.53** |
| | | 72" | 3.71E-03 | 0.013 | 1.22E-05 | -0.83 | **-0.82** | 0.013 | 1.22E-05 | -0.93 | **-0.92** | | | | | | | | | 0.013 | 1.22E-05 | -0.55 | **-0.53** |
| | Brazil | 36" | 3.54E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 3.48E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 60" | 3.57E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 72" | 3.50E-03 | | | | | | | | | | | | | | | | | | | | |
| | Venezuela | 36" | 2.21E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 2.17E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 60" | 2.23E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 72" | 2.19E-03 | | | | | | | | | | | | | | | | | | | | |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

## 9.4 Eutrophication potential: North America and Europe

| Eutrophication Potential (kg $PO_4$-eq/$m^2$) | | PS Series | LX 40 | | | | Hilite 40 | | | | 4 Mil Clear | Sentinel 4 Mil Clear | | | | CDA & OSW | Silver AG 50 Low-E | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Transportation to Customer | Manufacturing | End-of-life | Operational Energy | Net kg $PO_4$-eq | Manufacturing | End-of-life | Operational Energy | Net kg $PO_4$-eq | Transportation to Customer | Manufacturing | End-of-life | Operational Energy | Net kg $PO_4$-eq | Transportation to Customer | Manufacturing | End-of-life | Operational Energy | Net kg $PO_4$-eq |
| North America | ASHRAE Climate Zone 1,2 36" | | | | | | | | | | 3.67E-05 | 0.005 | 3.61E-04 | -0.15 | **-0.15** | 2.18E-05 | 0.005 | 2.06E-04 | -1.94 | **-1.93** |
| | 48" | 2.86E-05 | | | | | 0.011 | 2.82E-04 | -2.15 | **-2.14** | 3.64E-05 | 0.005 | 3.60E-04 | -0.15 | **-0.15** | 2.12E-05 | 0.005 | 2.04E-04 | -1.94 | **-1.93** |
| | 60" | 2.94E-05 | | | | | 0.010 | 2.81E-04 | -2.15 | **-2.14** | 3.69E-05 | 0.005 | 3.59E-04 | -0.15 | **-0.15** | 2.17E-05 | 0.005 | 2.31E-04 | -1.94 | **-1.93** |
| | 72" | | | | | | | | | | 3.64E-05 | 0.005 | 3.58E-04 | -0.15 | **-0.15** | 2.16E-05 | | | | |
| | ASHRAE Climate Zone 3 36" | | | | | | | | | | 3.67E-05 | 0.005 | 3.61E-04 | -0.30 | **-0.30** | 2.18E-05 | 0.005 | 2.06E-04 | -1.74 | **-1.73** |
| | 48" | 2.86E-05 | | | | | 0.011 | 2.82E-04 | -1.84 | **-1.83** | 3.64E-05 | 0.005 | 3.60E-04 | -0.30 | **-0.30** | 2.12E-05 | 0.005 | 2.04E-04 | -1.74 | **-1.73** |
| | 60" | 2.94E-05 | | | | | 0.010 | 2.81E-04 | -1.84 | **-1.83** | 3.69E-05 | 0.005 | 3.59E-04 | -0.30 | **-0.30** | 2.17E-05 | 0.005 | 2.31E-04 | -1.74 | **-1.73** |
| | 72" | | | | | | | | | | 3.64E-05 | 0.005 | 3.58E-04 | -0.30 | **-0.30** | 2.16E-05 | | | | |
| | ASHRAE Climate Zone 4 36" | | | | | | | | | | 3.67E-05 | 0.005 | 3.61E-04 | -0.21 | **-0.21** | 2.18E-05 | 0.005 | 2.06E-04 | -1.20 | **-1.19** |
| | 48" | 2.86E-05 | | | | | 0.011 | 2.82E-04 | -1.30 | **-1.29** | 3.64E-05 | 0.005 | 3.60E-04 | -0.21 | **-0.21** | 2.12E-05 | 0.005 | 2.04E-04 | -1.20 | **-1.19** |
| | 60" | 2.94E-05 | | | | | 0.010 | 2.81E-04 | -1.30 | **-1.29** | 3.69E-05 | 0.005 | 3.59E-04 | -0.21 | **-0.21** | 2.17E-05 | 0.005 | 2.31E-04 | -1.20 | **-1.19** |
| | 72" | | | | | | | | | | 3.64E-05 | 0.005 | 3.58E-04 | -0.21 | **-0.21** | 2.16E-05 | | | | |
| | ASHRAE Climate Zone 5 36" | | | | | | | | | | 3.67E-05 | 0.005 | 3.61E-04 | -0.20 | **-0.19** | 2.18E-05 | 0.005 | 2.06E-04 | -1.08 | **-1.08** |
| | 48" | 2.86E-05 | | | | | 0.011 | 2.82E-04 | -1.19 | **-1.18** | 3.64E-05 | 0.005 | 3.60E-04 | -0.20 | **-0.19** | 2.12E-05 | 0.005 | 2.04E-04 | -1.08 | **-1.08** |
| | 60" | 2.94E-05 | | | | | 0.010 | 2.81E-04 | -1.19 | **-1.18** | 3.69E-05 | 0.005 | 3.59E-04 | -0.20 | **-0.19** | 2.17E-05 | 0.005 | 2.31E-04 | -1.08 | **-1.08** |
| | 72" | | | | | | | | | | 3.64E-05 | 0.005 | 3.58E-04 | -0.20 | **-0.19** | 2.16E-05 | | | | |
| | ASHRAE Climate Zone 6,7 36" | | | | | | | | | | 3.67E-05 | 0.005 | 3.61E-04 | -0.24 | **-0.23** | 2.18E-05 | 0.005 | 2.06E-04 | -1.30 | **-1.30** |
| | 48" | 2.86E-05 | | | | | 0.011 | 2.82E-04 | -1.43 | **-1.42** | 3.64E-05 | 0.005 | 3.60E-04 | -0.24 | **-0.23** | 2.12E-05 | 0.005 | 2.04E-04 | -1.30 | **-1.30** |
| | 60" | 2.94E-05 | | | | | 0.010 | 2.81E-04 | -1.43 | **-1.42** | 3.69E-05 | 0.005 | 3.59E-04 | -0.24 | **-0.23** | 2.17E-05 | 0.005 | 2.31E-04 | -1.30 | **-1.30** |
| | 72" | | | | | | | | | | 3.64E-05 | 0.005 | 3.58E-04 | -0.24 | **-0.23** | 2.16E-05 | | | | |
| | Canada 36" | | | | | | | | | | 1.25E-04 | | | | | 7.38E-05 | 0.005 | 2.06E-04 | -0.03 | **-0.03** |
| | 48" | 9.78E-05 | | | | | 0.011 | 2.82E-04 | -0.02 | **-0.01** | 1.23E-04 | | | | | 7.21E-05 | 0.005 | 2.04E-04 | -0.03 | **-0.03** |
| | 60" | 9.96E-05 | | | | | 0.010 | 2.81E-04 | -0.02 | **-0.01** | 1.25E-04 | | | | | 7.40E-05 | 0.005 | 2.31E-04 | -0.03 | **-0.03** |
| | 72" | | | | | | | | | | 1.24E-04 | | | | | 7.29E-05 | | | | |
| | Mexico 36" | | | | | | | | | | 3.52E-05 | 0.005 | 3.61E-04 | -0.03 | **-0.02** | 2.08E-05 | 0.005 | 2.06E-04 | -0.16 | **-0.16** |
| | 48" | | | | | | | | | | 3.49E-05 | 0.005 | 3.60E-04 | -0.03 | **-0.02** | 2.04E-05 | 0.005 | 2.04E-04 | -0.16 | **-0.16** |
| | 60" | | | | | | | | | | 3.54E-05 | 0.005 | 3.59E-04 | -0.03 | **-0.02** | 2.11E-05 | 0.005 | 2.31E-04 | -0.16 | **-0.16** |
| | 72" | | | | | | | | | | 3.52E-05 | 0.005 | 3.58E-04 | -0.03 | **-0.02** | 2.06E-05 | | | | |
| Europe | France 36" | | | | | | | | | | 1.28E-03 | 0.005 | 2.17E-04 | -0.04 | **-0.04** | 7.55E-04 | 0.005 | 1.28E-04 | -0.23 | **-0.23** |
| | 48" | | | | | | | | | | 1.27E-03 | 0.005 | 2.15E-04 | -0.04 | **-0.04** | 7.42E-04 | 0.005 | 1.26E-04 | -0.23 | **-0.23** |
| | 60" | | | | | | | | | | 1.29E-03 | 0.005 | 2.16E-04 | -0.04 | **-0.04** | 7.60E-04 | 0.005 | 1.43E-04 | -0.23 | **-0.23** |
| | 72" | | | | | | | | | | 1.27E-03 | 0.005 | 2.15E-04 | -0.04 | **-0.04** | 7.48E-04 | | | | |
| | Northern Europe 36" | | | | | | | | | | 1.28E-03 | 0.005 | 5.18E-05 | -0.27 | **-0.26** | 7.60E-04 | 0.005 | 4.25E-05 | -1.45 | **-1.44** |
| | 48" | 1.00E-03 | | | | | | | | | 1.27E-03 | 0.005 | 5.03E-05 | -0.27 | **-0.26** | 7.43E-04 | 0.005 | 4.10E-05 | -1.45 | **-1.44** |
| | 60" | 1.02E-03 | 0.010 | 4.73E-05 | -1.59 | **-1.58** | | | | | 1.29E-03 | 0.005 | 5.20E-05 | -0.27 | **-0.26** | 7.62E-04 | 0.005 | 4.43E-05 | -1.45 | **-1.44** |
| | 72" | | | | | | | | | | 1.28E-03 | 0.005 | 5.09E-05 | -0.27 | **-0.26** | 7.49E-04 | | | | |
| | Russia 36" | | | | | | | | | | | | | | | 8.00E-04 | | | | |
| | 48" | | | | | | | | | | | | | | | 7.83E-04 | | | | |
| | 60" | | | | | | | | | | | | | | | 8.02E-04 | | | | |
| | 72" | | | | | | | | | | | | | | | 7.88E-04 | | | | |
| | Scandivania 36" | | | | | | | | | | 1.25E-03 | 0.005 | 1.15E-04 | -0.05 | **-0.04** | 7.40E-04 | 0.005 | 6.95E-05 | -0.27 | **-0.26** |
| | 48" | 9.78E-04 | | | | | | | | | 1.23E-03 | 0.005 | 1.14E-04 | -0.05 | **-0.04** | 7.23E-04 | 0.005 | 6.82E-05 | -0.27 | **-0.26** |
| | 60" | 9.98E-04 | 0.010 | 9.26E-05 | -0.28 | **-0.27** | | | | | 1.25E-03 | 0.005 | 1.16E-04 | -0.05 | **-0.04** | 7.42E-04 | 0.005 | 7.78E-05 | -0.27 | **-0.26** |
| | 72" | | | | | | | | | | 1.24E-03 | 0.005 | 1.15E-04 | -0.05 | **-0.04** | 7.29E-04 | | | | |
| | Southern Europe 36" | | | | | | | | | | 1.28E-03 | 0.005 | 5.18E-05 | -0.17 | **-0.17** | 7.60E-04 | | | | |
| | 48" | | | | | | | | | | 1.27E-03 | 0.005 | 5.03E-05 | -0.17 | **-0.17** | 7.43E-04 | | | | |
| | 60" | | | | | | | | | | 1.29E-03 | 0.005 | 5.20E-05 | -0.17 | **-0.17** | 7.62E-04 | | | | |
| | 72" | | | | | | | | | | 1.28E-03 | 0.005 | 5.09E-05 | -0.17 | **-0.17** | 7.51E-04 | | | | |
| | United Kingdom 36" | | | | | | | | | | 1.22E-03 | 0.005 | 3.74E-04 | -0.07 | **-0.07** | 7.21E-04 | 0.005 | 2.08E-04 | -0.39 | **-0.39** |
| | 48" | 9.54E-04 | | | | | | | | | 1.20E-03 | 0.005 | 3.73E-04 | -0.07 | **-0.07** | 7.06E-04 | 0.005 | 2.07E-04 | -0.39 | **-0.39** |
| | 60" | 9.73E-04 | 0.010 | 2.89E-04 | -0.44 | **-0.43** | | | | | 1.22E-03 | 0.005 | 3.72E-04 | -0.07 | **-0.07** | 7.23E-04 | 0.005 | 2.05E-04 | -0.39 | **-0.39** |
| | 72" | | | | | | | | | | 1.21E-03 | 0.005 | 3.72E-04 | -0.07 | **-0.07** | 7.12E-04 | | | | |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

## 9.4 Eutrophication potential: North America and Europe (cont.)

| Eutrophication Potential (kg $PO_4$-eq/$m^2$) | | | CDA & OSW | TrueVue 5 | | | | TrueVue 15 | | | | TrueVue 30 | | | | TrueVue 40 | | | | Sentinel Silver 20 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Transportation to Customer | Manufacturing | End-of-life | Operational Energy | **Net kg $PO_4$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $PO_4$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $PO_4$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $PO_4$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $PO_4$-eq** |
| North America | ASHRAE Climate Zone 1,2 | 36" | 2.18E-05 | 0.005 | 2.06E-04 | -3.16 | **-3.16** | 0.005 | 2.06E-04 | -3.06 | **-3.05** | 0.005 | 2.06E-04 | -2.17 | **-2.17** | 0.004 | 2.06E-04 | -1.70 | **-1.69** | 0.004 | 2.06E-04 | -1.69 | **-1.68** |
| | | 48" | 2.12E-05 | 0.006 | 2.04E-04 | -3.16 | **-3.16** | 0.006 | 2.04E-04 | -3.06 | **-3.05** | 0.005 | 2.04E-04 | -2.17 | **-2.17** | 0.005 | 2.04E-04 | -1.70 | **-1.69** | 0.004 | 2.04E-04 | -1.69 | **-1.68** |
| | | 60" | 2.17E-05 | 0.006 | 2.03E-04 | -3.16 | **-3.16** | 0.006 | 2.03E-04 | -3.06 | **-3.05** | 0.005 | 2.03E-04 | -2.17 | **-2.17** | 0.005 | 2.03E-04 | -1.70 | **-1.69** | 0.004 | 2.03E-04 | -1.69 | **-1.68** |
| | | 72" | 2.16E-05 | 0.005 | 2.03E-04 | -3.16 | **-3.16** | 0.005 | 2.03E-04 | -3.06 | **-3.05** | 0.005 | 2.03E-04 | -2.17 | **-2.17** | 0.004 | 2.03E-04 | -1.70 | **-1.69** | 0.004 | 2.03E-04 | -1.69 | **-1.68** |
| | ASHRAE Climate Zone 3 | 36" | 2.18E-05 | 0.005 | 2.06E-04 | -2.71 | **-2.70** | 0.005 | 2.06E-04 | -2.64 | **-2.63** | 0.005 | 2.06E-04 | -1.88 | **-1.88** | 0.004 | 2.06E-04 | -1.49 | **-1.49** | 0.004 | 2.06E-04 | -1.65 | **-1.65** |
| | | 48" | 2.12E-05 | 0.006 | 2.04E-04 | -2.71 | **-2.70** | 0.006 | 2.04E-04 | -2.64 | **-2.63** | 0.005 | 2.04E-04 | -1.88 | **-1.88** | 0.005 | 2.04E-04 | -1.49 | **-1.49** | 0.004 | 2.04E-04 | -1.65 | **-1.65** |
| | | 60" | 2.17E-05 | 0.006 | 2.03E-04 | -2.71 | **-2.70** | 0.006 | 2.03E-04 | -2.64 | **-2.63** | 0.005 | 2.03E-04 | -1.88 | **-1.88** | 0.005 | 2.03E-04 | -1.49 | **-1.49** | 0.004 | 2.03E-04 | -1.65 | **-1.65** |
| | | 72" | 2.16E-05 | 0.005 | 2.03E-04 | -2.71 | **-2.70** | 0.005 | 2.03E-04 | -2.64 | **-2.63** | 0.005 | 2.03E-04 | -1.88 | **-1.88** | 0.004 | 2.03E-04 | -1.49 | **-1.49** | 0.004 | 2.03E-04 | -1.65 | **-1.65** |
| | ASHRAE Climate Zone 4 | 36" | 2.18E-05 | 0.005 | 2.06E-04 | -1.90 | **-1.89** | 0.005 | 2.06E-04 | -1.84 | **-1.84** | 0.005 | 2.06E-04 | -1.33 | **-1.32** | 0.004 | 2.06E-04 | -1.05 | **-1.04** | 0.004 | 2.06E-04 | -1.18 | **-1.17** |
| | | 48" | 2.12E-05 | 0.006 | 2.04E-04 | -1.90 | **-1.89** | 0.006 | 2.04E-04 | -1.84 | **-1.84** | 0.005 | 2.04E-04 | -1.33 | **-1.32** | 0.005 | 2.04E-04 | -1.05 | **-1.04** | 0.004 | 2.04E-04 | -1.18 | **-1.17** |
| | | 60" | 2.17E-05 | 0.006 | 2.03E-04 | -1.90 | **-1.89** | 0.006 | 2.03E-04 | -1.84 | **-1.84** | 0.005 | 2.03E-04 | -1.33 | **-1.32** | 0.005 | 2.03E-04 | -1.05 | **-1.04** | 0.004 | 2.03E-04 | -1.18 | **-1.17** |
| | | 72" | 2.16E-05 | 0.005 | 2.03E-04 | -1.90 | **-1.89** | 0.005 | 2.03E-04 | -1.84 | **-1.84** | 0.005 | 2.03E-04 | -1.33 | **-1.32** | 0.004 | 2.03E-04 | -1.05 | **-1.04** | 0.004 | 2.03E-04 | -1.18 | **-1.17** |
| | ASHRAE Climate Zone 5 | 36" | 2.18E-05 | 0.005 | 2.06E-04 | -1.71 | **-1.71** | 0.005 | 2.06E-04 | -1.67 | **-1.66** | 0.005 | 2.06E-04 | -1.21 | **-1.20** | 0.004 | 2.06E-04 | -0.96 | **-0.96** | 0.004 | 2.06E-04 | -1.06 | **-1.05** |
| | | 48" | 2.12E-05 | 0.006 | 2.04E-04 | -1.71 | **-1.70** | 0.006 | 2.04E-04 | -1.67 | **-1.66** | 0.005 | 2.04E-04 | -1.21 | **-1.20** | 0.005 | 2.04E-04 | -0.96 | **-0.96** | 0.004 | 2.04E-04 | -1.06 | **-1.05** |
| | | 60" | 2.17E-05 | 0.006 | 2.03E-04 | -1.71 | **-1.71** | 0.006 | 2.03E-04 | -1.67 | **-1.66** | 0.005 | 2.03E-04 | -1.21 | **-1.20** | 0.005 | 2.03E-04 | -0.96 | **-0.96** | 0.004 | 2.03E-04 | -1.06 | **-1.05** |
| | | 72" | 2.16E-05 | 0.005 | 2.03E-04 | -1.71 | **-1.71** | 0.005 | 2.03E-04 | -1.67 | **-1.66** | 0.005 | 2.03E-04 | -1.21 | **-1.20** | 0.004 | 2.03E-04 | -0.96 | **-0.96** | 0.004 | 2.03E-04 | -1.06 | **-1.05** |
| | ASHRAE Climate Zone 6,7 | 36" | 2.18E-05 | 0.005 | 2.06E-04 | -2.05 | **-2.05** | 0.005 | 2.06E-04 | -2.00 | **-1.99** | 0.005 | 2.06E-04 | -1.46 | **-1.45** | 0.004 | 2.06E-04 | -1.16 | **-1.16** | 0.004 | 2.06E-04 | -1.26 | **-1.26** |
| | | 48" | 2.12E-05 | 0.006 | 2.04E-04 | -2.05 | **-2.05** | 0.006 | 2.04E-04 | -2.00 | **-1.99** | 0.005 | 2.04E-04 | -1.46 | **-1.45** | 0.005 | 2.04E-04 | -1.16 | **-1.16** | 0.004 | 2.04E-04 | -1.26 | **-1.26** |
| | | 60" | 2.17E-05 | 0.006 | 2.03E-04 | -2.05 | **-2.05** | 0.006 | 2.03E-04 | -2.00 | **-1.99** | 0.005 | 2.03E-04 | -1.46 | **-1.45** | 0.005 | 2.03E-04 | -1.16 | **-1.16** | 0.004 | 2.03E-04 | -1.26 | **-1.26** |
| | | 72" | 2.16E-05 | 0.005 | 2.03E-04 | -2.05 | **-2.05** | 0.005 | 2.03E-04 | -2.00 | **-1.99** | 0.005 | 2.03E-04 | -1.46 | **-1.45** | 0.004 | 2.03E-04 | -1.16 | **-1.16** | 0.004 | 2.03E-04 | -1.26 | **-1.26** |
| | Canada | 36" | 7.38E-05 | 0.005 | 2.06E-04 | -0.03 | **-0.02** | 0.005 | 2.06E-04 | -0.03 | **-0.02** | 0.005 | 2.06E-04 | -0.02 | **-0.02** | 0.004 | 2.06E-04 | -0.02 | **-0.01** | 0.004 | 2.06E-04 | -0.01 | **0.00** |
| | | 48" | 7.21E-05 | 0.006 | 2.04E-04 | -0.03 | **-0.02** | 0.006 | 2.04E-04 | -0.03 | **-0.02** | 0.005 | 2.04E-04 | -0.02 | **-0.02** | 0.005 | 2.04E-04 | -0.02 | **-0.01** | 0.004 | 2.04E-04 | -0.01 | **0.00** |
| | | 60" | 7.40E-05 | 0.006 | 2.03E-04 | -0.03 | **-0.02** | 0.006 | 2.03E-04 | -0.03 | **-0.02** | 0.005 | 2.03E-04 | -0.02 | **-0.02** | 0.005 | 2.03E-04 | -0.02 | **-0.01** | 0.004 | 2.03E-04 | -0.01 | **0.00** |
| | | 72" | 7.29E-05 | 0.005 | 2.03E-04 | -0.03 | **-0.02** | 0.005 | 2.03E-04 | -0.03 | **-0.02** | 0.005 | 2.03E-04 | -0.02 | **-0.02** | 0.004 | 2.03E-04 | -0.02 | **-0.01** | 0.004 | 2.03E-04 | -0.01 | **0.00** |
| | Mexico | 36" | 2.08E-05 | | | | | | | | | | | | | | | | | 0.004 | 2.06E-04 | -0.16 | **-0.16** |
| | | 48" | 2.04E-05 | | | | | | | | | | | | | | | | | 0.004 | 2.04E-04 | -0.16 | **-0.16** |
| | | 60" | 2.11E-05 | | | | | | | | | | | | | | | | | 0.004 | 2.03E-04 | -0.16 | **-0.16** |
| | | 72" | 2.06E-05 | | | | | | | | | | | | | | | | | 0.004 | 2.03E-04 | -0.16 | **-0.16** |
| Europe | France | 36" | 7.55E-04 | | | | | | | | | | | | | | | | | 0.004 | 1.28E-04 | -0.23 | **-0.23** |
| | | 48" | 7.42E-04 | | | | | | | | | | | | | | | | | 0.004 | 1.26E-04 | -0.23 | **-0.23** |
| | | 60" | 7.60E-04 | | | | | | | | | | | | | | | | | 0.004 | 1.27E-04 | -0.23 | **-0.23** |
| | | 72" | 7.48E-04 | | | | | | | | | | | | | | | | | 0.004 | 1.26E-04 | -0.23 | **-0.23** |
| | Northern Europe | 36" | 7.60E-04 | | | | | | | | | | | | | | | | | 0.004 | 4.25E-05 | -1.45 | **-1.44** |
| | | 48" | 7.43E-04 | | | | | | | | | | | | | | | | | 0.004 | 4.10E-05 | -1.45 | **-1.44** |
| | | 60" | 7.62E-04 | | | | | | | | | | | | | | | | | 0.004 | 4.27E-05 | -1.45 | **-1.44** |
| | | 72" | 7.49E-04 | | | | | | | | | | | | | | | | | 0.004 | 4.17E-05 | -1.45 | **-1.44** |
| | Russia | 36" | 8.00E-04 | | | | | | | | | | | | | | | | | 0.004 | 2.06E-04 | -0.01 | **-0.01** |
| | | 48" | 7.83E-04 | | | | | | | | | | | | | | | | | 0.004 | 2.04E-04 | -0.01 | **-0.01** |
| | | 60" | 8.02E-04 | | | | | | | | | | | | | | | | | 0.004 | 2.03E-04 | -0.01 | **-0.01** |
| | | 72" | 7.88E-04 | | | | | | | | | | | | | | | | | 0.004 | 2.03E-04 | -0.01 | **-0.01** |
| | Scandivania | 36" | 7.40E-04 | 0.005 | 6.95E-05 | -0.41 | **-0.40** | 0.005 | 6.95E-05 | -0.40 | **-0.39** | | | | | | | | | 0.004 | 6.95E-05 | -0.25 | **-0.25** |
| | | 48" | 7.23E-04 | 0.006 | 6.82E-05 | -0.41 | **-0.40** | 0.006 | 6.82E-05 | -0.40 | **-0.39** | | | | | | | | | 0.004 | 6.82E-05 | -0.25 | **-0.25** |
| | | 60" | 7.42E-04 | 0.006 | 6.97E-05 | -0.41 | **-0.40** | 0.006 | 6.97E-05 | -0.40 | **-0.39** | | | | | | | | | 0.004 | 6.97E-05 | -0.25 | **-0.25** |
| | | 72" | 7.29E-04 | 0.005 | 6.88E-05 | -0.41 | **-0.40** | 0.005 | 6.88E-05 | -0.40 | **-0.39** | | | | | | | | | 0.004 | 6.88E-05 | -0.25 | **-0.25** |
| | Southern Europe | 36" | 7.60E-04 | | | | | | | | | | | | | | | | | 0.004 | 4.25E-05 | -0.96 | **-0.95** |
| | | 48" | 7.43E-04 | | | | | | | | | | | | | | | | | 0.004 | 4.10E-05 | -0.96 | **-0.95** |
| | | 60" | 7.62E-04 | | | | | | | | | | | | | | | | | 0.004 | 4.27E-05 | -0.96 | **-0.95** |
| | | 72" | 7.51E-04 | | | | | | | | | | | | | | | | | 0.004 | 4.17E-05 | -0.96 | **-0.95** |
| | United Kingdom | 36" | 7.21E-04 | 0.005 | 2.08E-04 | -0.64 | **-0.63** | 0.005 | 2.08E-04 | -0.62 | **-0.62** | 0.005 | 2.08E-04 | -0.45 | **-0.45** | 0.004 | 2.08E-04 | -0.36 | **-0.35** | 0.004 | 2.08E-04 | -0.41 | **-0.40** |
| | | 48" | 7.06E-04 | 0.006 | 2.07E-04 | -0.64 | **-0.63** | 0.006 | 2.07E-04 | -0.62 | **-0.62** | 0.005 | 2.07E-04 | -0.45 | **-0.45** | 0.005 | 2.07E-04 | -0.36 | **-0.35** | 0.004 | 2.07E-04 | -0.41 | **-0.40** |
| | | 60" | 7.23E-04 | 0.006 | 2.06E-04 | -0.64 | **-0.63** | 0.006 | 2.06E-04 | -0.62 | **-0.62** | 0.005 | 2.06E-04 | -0.45 | **-0.45** | 0.005 | 2.06E-04 | -0.36 | **-0.35** | 0.004 | 2.06E-04 | -0.41 | **-0.40** |
| | | 72" | 7.12E-04 | 0.005 | 2.06E-04 | -0.64 | **-0.63** | 0.005 | 2.06E-04 | -0.62 | **-0.62** | 0.005 | 2.06E-04 | -0.45 | **-0.45** | 0.004 | 2.06E-04 | -0.36 | **-0.35** | 0.004 | 2.06E-04 | -0.41 | **-0.40** |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

## 9.4 Eutrophication potential: North America and Europe (cont.)

| Eutrophication Potential (kg $PO_4$-eq/$m^2$) | | | CDA & OSW Transportation to Customer | Sentinel Silver 35 | | | | Sentinel Stainless Steel 15 | | | | Sentinel Stainless Steel 25 | | | | Sentinel Stainless Steel 40 | | | | Sentinel Stainless Steel 45 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Manufacturing | End-of-life | Operational Energy | **Net kg $PO_4$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $PO_4$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $PO_4$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $PO_4$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $PO_4$-eq** |
| North America | ASHRAE Climate Zone 1,2 | 36" | 2.18E-05 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 2.12E-05 | 0.004 | 2.04E-04 | -1.33 | **-1.33** | | | | | | | | | | | | | | | | |
| | | 60" | 2.17E-05 | 0.004 | 2.03E-04 | -1.33 | **-1.33** | 0.004 | 2.03E-04 | -1.47 | **-1.47** | 0.004 | 2.03E-04 | -1.24 | **-1.23** | 0.004 | 2.03E-04 | -0.92 | **-0.92** | 0.004 | 2.03E-04 | -0.78 | **-0.78** |
| | | 72" | 2.16E-05 | 0.004 | 2.03E-04 | -1.33 | **-1.33** | 0.004 | 2.03E-04 | -1.47 | **-1.47** | 0.004 | 2.03E-04 | -1.24 | **-1.23** | 0.004 | 2.03E-04 | -0.92 | **-0.92** | 0.004 | 2.03E-04 | -0.78 | **-0.78** |
| | ASHRAE Climate Zone 3 | 36" | 2.18E-05 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 2.12E-05 | 0.004 | 2.04E-04 | -1.39 | **-1.39** | | | | | | | | | | | | | | | | |
| | | 60" | 2.17E-05 | 0.004 | 2.03E-04 | -1.39 | **-1.39** | 0.004 | 2.03E-04 | -1.56 | **-1.56** | 0.004 | 2.03E-04 | -1.35 | **-1.34** | 0.004 | 2.03E-04 | -1.05 | **-1.05** | 0.004 | 2.03E-04 | -0.92 | **-0.92** |
| | | 72" | 2.16E-05 | 0.004 | 2.03E-04 | -1.39 | **-1.39** | 0.004 | 2.03E-04 | -1.56 | **-1.56** | 0.004 | 2.03E-04 | -1.35 | **-1.34** | 0.004 | 2.03E-04 | -1.05 | **-1.05** | 0.004 | 2.03E-04 | -0.92 | **-0.92** |
| | ASHRAE Climate Zone 4 | 36" | 2.18E-05 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 2.12E-05 | 0.004 | 2.04E-04 | -0.97 | **-0.96** | | | | | | | | | | | | | | | | |
| | | 60" | 2.17E-05 | 0.004 | 2.03E-04 | -0.97 | **-0.96** | 0.004 | 2.03E-04 | -1.08 | **-1.08** | 0.004 | 2.03E-04 | -0.94 | **-0.94** | 0.004 | 2.03E-04 | -0.74 | **-0.73** | 0.004 | 2.03E-04 | -0.65 | **-0.65** |
| | | 72" | 2.16E-05 | 0.004 | 2.03E-04 | -0.97 | **-0.96** | 0.004 | 2.03E-04 | -1.08 | **-1.08** | 0.004 | 2.03E-04 | -0.94 | **-0.94** | 0.004 | 2.03E-04 | -0.74 | **-0.73** | 0.004 | 2.03E-04 | -0.65 | **-0.65** |
| | ASHRAE Climate Zone 5 | 36" | 2.18E-05 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 2.12E-05 | 0.004 | 2.04E-04 | -0.88 | **-0.87** | | | | | | | | | | | | | | | | |
| | | 60" | 2.17E-05 | 0.004 | 2.03E-04 | -0.88 | **-0.87** | 0.004 | 2.03E-04 | -0.98 | **-0.97** | 0.004 | 2.03E-04 | -0.85 | **-0.84** | 0.004 | 2.03E-04 | -0.68 | **-0.67** | 0.004 | 2.03E-04 | -0.60 | **-0.59** |
| | | 72" | 2.16E-05 | 0.004 | 2.03E-04 | -0.88 | **-0.87** | 0.004 | 2.03E-04 | -0.98 | **-0.97** | 0.004 | 2.03E-04 | -0.85 | **-0.84** | 0.004 | 2.03E-04 | -0.68 | **-0.67** | 0.004 | 2.03E-04 | -0.60 | **-0.59** |
| | ASHRAE Climate Zone 6,7 | 36" | 2.18E-05 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 2.12E-05 | 0.004 | 2.04E-04 | -1.05 | **-1.05** | | | | | | | | | | | | | | | | |
| | | 60" | 2.17E-05 | 0.004 | 2.03E-04 | -1.05 | **-1.04** | 0.004 | 2.03E-04 | -1.17 | **-1.16** | 0.004 | 2.03E-04 | -1.02 | **-1.01** | 0.004 | 2.03E-04 | -0.81 | **-0.80** | 0.004 | 2.03E-04 | -0.71 | **-0.71** |
| | | 72" | 2.16E-05 | 0.004 | 2.03E-04 | -1.05 | **-1.04** | 0.004 | 2.03E-04 | -1.17 | **-1.16** | 0.004 | 2.03E-04 | -1.02 | **-1.01** | 0.004 | 2.03E-04 | -0.81 | **-0.80** | 0.004 | 2.03E-04 | -0.71 | **-0.71** |
| | Canada | 36" | 7.38E-05 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 7.21E-05 | | | | | | | | | | | | | | | | | | | | |
| | | 60" | 7.40E-05 | | | | | 0.004 | 2.03E-04 | -0.01 | **-0.01** | 0.004 | 2.03E-04 | -0.01 | **-0.01** | 0.004 | 2.03E-04 | -0.01 | **-0.01** | 0.004 | 2.03E-04 | -0.01 | **-0.01** |
| | | 72" | 7.29E-05 | | | | | 0.004 | 2.03E-04 | -0.01 | **-0.01** | 0.004 | 2.03E-04 | -0.01 | **-0.01** | 0.004 | 2.03E-04 | -0.01 | **-0.01** | 0.004 | 2.03E-04 | -0.01 | **-0.01** |
| | Mexico | 36" | 2.08E-05 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 2.04E-05 | 0.004 | 2.04E-04 | -0.13 | **-0.13** | | | | | | | | | | | | | | | | |
| | | 60" | 2.11E-05 | 0.004 | 2.03E-04 | -0.13 | **-0.13** | | | | | | | | | | | | | 0.004 | 2.03E-04 | -0.09 | **-0.08** |
| | | 72" | 2.06E-05 | 0.004 | 2.03E-04 | -0.13 | **-0.13** | | | | | | | | | | | | | 0.004 | 2.03E-04 | -0.09 | **-0.08** |
| Europe | France | 36" | 7.55E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 7.42E-04 | 0.004 | 1.26E-04 | -0.19 | **-0.18** | | | | | | | | | | | | | | | | |
| | | 60" | 7.60E-04 | 0.004 | 1.27E-04 | -0.19 | **-0.18** | 0.004 | 1.27E-04 | -0.21 | **-0.21** | 0.004 | 1.27E-04 | -0.18 | **-0.18** | 0.004 | 1.27E-04 | -0.14 | **-0.14** | 0.004 | 1.27E-04 | -0.13 | **-0.12** |
| | | 72" | 7.48E-04 | 0.004 | 1.26E-04 | -0.19 | **-0.18** | 0.004 | 1.26E-04 | -0.21 | **-0.21** | 0.004 | 1.26E-04 | -0.18 | **-0.18** | 0.004 | 1.26E-04 | -0.14 | **-0.14** | 0.004 | 1.26E-04 | -0.13 | **-0.12** |
| | Northern Europe | 36" | 7.60E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 7.43E-04 | 0.004 | 4.10E-05 | -1.18 | **-1.17** | | | | | | | | | | | | | | | | |
| | | 60" | 7.62E-04 | 0.004 | 4.43E-05 | -1.18 | **-1.17** | 0.004 | 4.27E-05 | -1.33 | **-1.32** | 0.004 | 4.27E-05 | -1.15 | **-1.15** | 0.004 | 4.27E-05 | -0.91 | **-0.90** | 0.004 | 4.27E-05 | -0.80 | **-0.80** |
| | | 72" | 7.49E-04 | 0.004 | 4.17E-05 | -1.18 | **-1.17** | 0.004 | 4.17E-05 | -1.33 | **-1.32** | 0.004 | 4.17E-05 | -1.15 | **-1.15** | 0.004 | 4.17E-05 | -0.91 | **-0.90** | 0.004 | 4.17E-05 | -0.80 | **-0.80** |
| | Russia | 36" | 8.00E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 7.83E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 60" | 8.02E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 72" | 7.88E-04 | | | | | | | | | | | | | | | | | | | | |
| | Scandivania | 36" | 7.40E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 7.23E-04 | 0.004 | 6.82E-05 | -0.21 | **-0.21** | | | | | | | | | | | | | | | | |
| | | 60" | 7.42E-04 | 0.004 | 6.97E-05 | -0.21 | **-0.21** | 0.004 | 6.97E-05 | -0.23 | **-0.23** | 0.004 | 6.97E-05 | -0.20 | **-0.20** | 0.004 | 6.97E-05 | -0.16 | **-0.16** | 0.004 | 6.97E-05 | -0.14 | **-0.14** |
| | | 72" | 7.29E-04 | 0.004 | 6.88E-05 | -0.21 | **-0.21** | 0.004 | 6.88E-05 | -0.23 | **-0.23** | 0.004 | 6.88E-05 | -0.20 | **-0.20** | 0.004 | 1.07E-04 | -0.16 | **-0.16** | 0.004 | 6.88E-05 | -0.14 | **-0.14** |
| | Southern Europe | 36" | 7.60E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 7.43E-04 | 0.004 | 4.10E-05 | -0.78 | **-0.78** | | | | | | | | | | | | | | | | |
| | | 60" | 7.62E-04 | 0.004 | 4.27E-05 | -0.78 | **-0.78** | 0.004 | 4.27E-05 | -0.88 | **-0.87** | 0.004 | 4.27E-05 | -0.76 | **-0.75** | 0.004 | 4.27E-05 | -0.59 | **-0.59** | 0.004 | 4.27E-05 | -0.52 | **-0.52** |
| | | 72" | 7.51E-04 | 0.004 | 4.17E-05 | -0.78 | **-0.78** | 0.004 | 4.17E-05 | -0.88 | **-0.87** | 0.004 | 4.17E-05 | -0.76 | **-0.75** | 0.004 | 4.17E-05 | -0.59 | **-0.59** | 0.004 | 4.17E-05 | -0.52 | **-0.52** |
| | United Kingdom | 36" | 7.21E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 7.06E-04 | 0.004 | 2.07E-04 | -0.33 | **-0.32** | | | | | | | | | | | | | | | | |
| | | 60" | 7.23E-04 | 0.004 | 2.06E-04 | -0.33 | **-0.32** | 0.004 | 2.06E-04 | -0.37 | **-0.37** | 0.004 | 2.06E-04 | -0.32 | **-0.31** | 0.004 | 2.06E-04 | -0.25 | **-0.25** | 0.004 | 2.06E-04 | -0.22 | **-0.22** |
| | | 72" | 7.12E-04 | 0.004 | 2.06E-04 | -0.33 | **-0.32** | 0.004 | 2.06E-04 | -0.37 | **-0.37** | 0.004 | 1.75E-04 | -0.32 | **-0.31** | 0.004 | 2.06E-04 | -0.25 | **-0.25** | 0.004 | 2.06E-04 | -0.22 | **-0.22** |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

## 9.4 Eutrophication potential: Asia and South America

| Eutrophication Potential (kg $PO_4$-eq/$m^2$) | | PS Series | LX 40 | | | | Hilite 40 | | | | 4 Mil Clear | Sentinel 4 Mil Clear | | | | CDA & OSW | Silver AG 50 Low-E | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Transportation to Customer | Manufacturing | End-of-life | Operational Energy | **Net kg $PO_4$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $PO_4$-eq** | Transportation to Customer | Manufacturing | End-of-life | Operational Energy | **Net kg $PO_4$-eq** | Transportation to Customer | Manufacturing | End-of-life | Operational Energy | **Net kg $PO_4$-eq** |
| Asia and Pacific | Australia 36" | | | | | | | | | | 1.76E-03 | 0.005 | 3.61E-04 | -0.03 | **-0.02** | 1.04E-03 | 0.005 | 2.06E-04 | -0.15 | **-0.14** |
| | Australia 48" | | | | | | | | | | 1.74E-03 | 0.005 | 3.60E-04 | -0.03 | **-0.02** | 1.02E-03 | 0.005 | 2.04E-04 | -0.15 | **-0.14** |
| | Australia 60" | | | | | | | | | | 1.77E-03 | 0.005 | 3.59E-04 | -0.03 | **-0.02** | 1.04E-03 | 0.005 | 2.31E-04 | -0.15 | **-0.14** |
| | Australia 72" | | | | | | | | | | 1.75E-03 | 0.005 | 3.58E-04 | -0.03 | **-0.02** | 1.03E-03 | | | | |
| | China, Mid-East Coast 36" | | | | | | | | | | 1.40E-03 | | | | | 8.26E-04 | | | | |
| | China, Mid-East Coast 48" | 1.09E-03 | | | | | | | | | 1.38E-03 | | | | | 8.10E-04 | | | | |
| | China, Mid-East Coast 60" | 9.73E-04 | | | | | | | | | 1.40E-03 | | | | | 8.32E-04 | | | | |
| | China, Mid-East Coast 72" | | | | | | | | | | 1.39E-03 | | | | | 8.17E-04 | | | | |
| | North-East Asia 36" | | | | | | | | | | 1.40E-03 | | | | | 8.26E-04 | 0.005 | 2.06E-04 | -0.93 | **-0.92** |
| | North-East Asia 48" | 1.09E-03 | | | | | | | | | 1.38E-03 | | | | | 8.10E-04 | 0.005 | 2.04E-04 | -0.93 | **-0.92** |
| | North-East Asia 60" | 9.73E-04 | | | | | | | | | 1.40E-03 | | | | | 8.32E-04 | 0.005 | 2.31E-04 | -0.93 | **-0.92** |
| | North-East Asia 72" | | | | | | | | | | 1.39E-03 | | | | | 8.17E-04 | | | | |
| | China, South-East 36" | | | | | | | | | | | | | | | 8.26E-04 | | | | |
| | China, South-East 48" | 1.09E-03 | | | | | | | | | | | | | | 8.10E-04 | | | | |
| | China, South-East 60" | 9.73E-04 | | | | | | | | | | | | | | 8.32E-04 | | | | |
| | China, South-East 72" | | | | | | | | | | | | | | | 8.17E-04 | | | | |
| | India 36" | | | | | | | | | | | | | | | | | | | |
| | India 48" | 1.39E-03 | | | | | | | | | | | | | | | | | | |
| | India 60" | 1.42E-03 | | | | | | | | | | | | | | | | | | |
| | India 72" | | | | | | | | | | | | | | | | | | | |
| | Japan 36" | | | | | | | | | | | | | | | 7.24E-04 | | | | |
| | Japan 48" | | | | | | | | | | | | | | | 7.10E-04 | | | | |
| | Japan 60" | | | | | | | | | | | | | | | 7.28E-04 | | | | |
| | Japan 72" | | | | | | | | | | | | | | | 7.15E-04 | | | | |
| | Malaysia 36" | | | | | | | | | | | | | | | 1.11E-03 | | | | |
| | Malaysia 48" | 1.47E-03 | | | | | | | | | | | | | | 1.09E-03 | | | | |
| | Malaysia 60" | 1.50E-03 | | | | | | | | | | | | | | 1.11E-03 | | | | |
| | Malaysia 72" | | | | | | | | | | | | | | | 1.09E-03 | | | | |
| | Middle East 36" | | | | | | | | | | | | | | | 1.08E-03 | 0.005 | 2.06E-04 | -0.23 | **-0.22** |
| | Middle East 48" | 1.43E-03 | | | | | | | | | | | | | | 1.06E-03 | 0.005 | 2.04E-04 | -0.23 | **-0.22** |
| | Middle East 60" | 1.46E-03 | | | | | | | | | | | | | | 1.09E-03 | 0.005 | 2.31E-04 | -0.23 | **-0.22** |
| | Middle East 72" | | | | | | | | | | | | | | | 1.07E-03 | | | | |
| | Turkey 36" | | | | | | | | | | | | | | | 9.20E-04 | | | | |
| | Turkey 48" | 1.22E-03 | | | | | | | | | | | | | | 9.00E-04 | | | | |
| | Turkey 60" | 1.24E-03 | | | | | | | | | | | | | | 9.22E-04 | | | | |
| | Turkey 72" | | | | | | | | | | | | | | | 9.06E-04 | | | | |
| South America | Argentina 36" | | | | | | | | | | | | | | | 7.77E-04 | | | | |
| | Argentina 48" | 1.03E-03 | | | | | | | | | | | | | | 7.63E-04 | | | | |
| | Argentina 60" | 1.05E-03 | | | | | | | | | | | | | | 7.81E-04 | | | | |
| | Argentina 72" | | | | | | | | | | | | | | | 7.69E-04 | | | | |
| | Brazil 36" | | | | | | | | | | | | | | | 7.33E-04 | | | | |
| | Brazil 48" | 9.73E-04 | | | | | | | | | | | | | | 7.20E-04 | | | | |
| | Brazil 60" | 9.92E-04 | 0.010 | 2.81E-04 | -0.20 | **-0.19** | | | | | | | | | | 7.38E-04 | | | | |
| | Brazil 72" | | | | | | | | | | | | | | | 7.24E-04 | | | | |
| | Venezuela 36" | | | | | | | | | | | | | | | 4.58E-04 | | | | |
| | Venezuela 48" | | | | | | | | | | | | | | | 4.50E-04 | | | | |
| | Venezuela 60" | | | | | | | | | | | | | | | 4.61E-04 | | | | |
| | Venezuela 72" | | | | | | | | | | | | | | | 4.53E-04 | | | | |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

## 9.4 Eutrophication potential: Asia and South America (cont.)

| Eutrophication Potential (kg $PO_4$-eq/$m^2$) | | CDA & OSW | TrueVue 5 | | | | TrueVue 15 | | | | TrueVue 30 | | | | TrueVue 40 | | | | Sentinel Silver 20 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Transportation to Customer | Manufacturing | End-of-life | Operational Energy | **Net kg $PO_4$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $PO_4$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $PO_4$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $PO_4$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $PO_4$-eq** |
| Asia and Pacific | | | | | | | | | | | | | | | | | | | | | | |
| Australia | 36" | 1.04E-03 | | | | | | | | | | | | | | | | | 0.004 | 2.06E-04 | -0.15 | **-0.14** |
| | 48" | 1.02E-03 | | | | | | | | | | | | | | | | | 0.004 | 2.04E-04 | -0.15 | **-0.14** |
| | 60" | 1.04E-03 | | | | | | | | | | | | | | | | | 0.004 | 2.03E-04 | -0.15 | **-0.14** |
| | 72" | 1.03E-03 | | | | | | | | | | | | | | | | | 0.004 | 2.03E-04 | -0.15 | **-0.14** |
| China, Mid-East Coast | 36" | 8.26E-04 | | | | | | | | | | | | | | | | | 0.004 | 2.06E-04 | -0.80 | **-0.79** |
| | 48" | 8.10E-04 | | | | | | | | | | | | | | | | | 0.004 | 2.04E-04 | -0.80 | **-0.79** |
| | 60" | 8.32E-04 | | | | | | | | | | | | | | | | | 0.004 | 2.03E-04 | -0.80 | **-0.79** |
| | 72" | 8.17E-04 | | | | | | | | | | | | | | | | | 0.004 | 2.03E-04 | -0.80 | **-0.79** |
| North-East Asia | 36" | 8.26E-04 | 0.005 | 2.06E-04 | -1.45 | **-1.44** | 0.005 | 2.06E-04 | -1.40 | **-1.40** | 0.005 | 2.06E-04 | -1.02 | **-1.01** | 0.004 | 2.06E-04 | -0.81 | **-0.81** | | | | |
| | 48" | 8.10E-04 | 0.006 | 2.04E-04 | -1.45 | **-1.44** | 0.006 | 2.04E-04 | -1.40 | **-1.40** | 0.005 | 2.04E-04 | -1.02 | **-1.01** | 0.005 | 2.04E-04 | -0.81 | **-0.81** | | | | |
| | 60" | 8.32E-04 | 0.006 | 2.03E-04 | -1.45 | **-1.44** | 0.006 | 2.03E-04 | -1.40 | **-1.40** | 0.005 | 2.03E-04 | -1.02 | **-1.01** | 0.005 | 2.03E-04 | -0.81 | **-0.81** | | | | |
| | 72" | 8.17E-04 | 0.005 | 2.03E-04 | -1.45 | **-1.44** | 0.005 | 2.03E-04 | -1.40 | **-1.40** | 0.005 | 2.03E-04 | -1.02 | **-1.01** | 0.004 | 2.03E-04 | -0.81 | **-0.81** | | | | |
| China, South-East | 36" | 8.26E-04 | | | | | | | | | | | | | | | | | 0.004 | 2.06E-04 | -1.04 | **-1.03** |
| | 48" | 8.10E-04 | | | | | | | | | | | | | | | | | 0.004 | 2.04E-04 | -1.04 | **-1.03** |
| | 60" | 8.32E-04 | | | | | | | | | | | | | | | | | 0.004 | 2.03E-04 | -1.04 | **-1.03** |
| | 72" | 8.17E-04 | | | | | | | | | | | | | | | | | 0.004 | 2.03E-04 | -1.04 | **-1.03** |
| India | 36" | | | | | | | | | | | | | | | | | | | | | |
| | 48" | | | | | | | | | | | | | | | | | | | | | |
| | 60" | | | | | | | | | | | | | | | | | | | | | |
| | 72" | | | | | | | | | | | | | | | | | | | | | |
| Japan | 36" | 7.24E-04 | | | | | | | | | | | | | | | | | 0.004 | 2.06E-04 | -0.63 | **-0.62** |
| | 48" | 7.10E-04 | | | | | | | | | | | | | | | | | 0.004 | 2.04E-04 | -0.63 | **-0.62** |
| | 60" | 7.28E-04 | | | | | | | | | | | | | | | | | 0.004 | 2.03E-04 | -0.63 | **-0.62** |
| | 72" | 7.15E-04 | | | | | | | | | | | | | | | | | 0.004 | 2.03E-04 | -0.63 | **-0.62** |
| Malaysia | 36" | 1.11E-03 | | | | | | | | | | | | | | | | | 0.004 | 2.06E-04 | -0.57 | **-0.57** |
| | 48" | 1.09E-03 | | | | | | | | | | | | | | | | | 0.004 | 2.04E-04 | -0.57 | **-0.57** |
| | 60" | 1.11E-03 | | | | | | | | | | | | | | | | | 0.004 | 2.03E-04 | -0.57 | **-0.57** |
| | 72" | 1.09E-03 | | | | | | | | | | | | | | | | | 0.004 | 1.92E-04 | -0.57 | **-0.57** |
| Middle East | 36" | 1.08E-03 | 0.005 | 2.06E-04 | -0.37 | **-0.36** | 0.005 | 2.06E-04 | -0.36 | **-0.35** | 0.005 | 2.06E-04 | -0.25 | **-0.25** | 0.004 | 2.06E-04 | -0.20 | **-0.19** | 0.004 | 2.06E-04 | -0.20 | **-0.19** |
| | 48" | 1.06E-03 | 0.006 | 2.04E-04 | -0.37 | **-0.36** | 0.006 | 2.04E-04 | -0.36 | **-0.35** | 0.005 | 2.04E-04 | -0.25 | **-0.25** | 0.005 | 2.04E-04 | -0.20 | **-0.19** | 0.004 | 2.04E-04 | -0.20 | **-0.19** |
| | 60" | 1.09E-03 | 0.006 | 2.03E-04 | -0.37 | **-0.36** | 0.006 | 2.03E-04 | -0.36 | **-0.35** | 0.005 | 2.03E-04 | -0.25 | **-0.25** | 0.005 | 2.03E-04 | -0.20 | **-0.19** | 0.004 | 2.03E-04 | -0.20 | **-0.19** |
| | 72" | 1.07E-03 | 0.005 | 2.03E-04 | -0.37 | **-0.36** | 0.005 | 2.03E-04 | -0.36 | **-0.35** | 0.005 | 2.03E-04 | -0.25 | **-0.25** | 0.004 | 2.03E-04 | -0.20 | **-0.19** | 0.004 | 2.03E-04 | -0.20 | **-0.19** |
| Turkey | 36" | 9.20E-04 | | | | | | | | | | | | | | | | | 0.004 | 2.06E-04 | -0.12 | **-0.12** |
| | 48" | 9.00E-04 | | | | | | | | | | | | | | | | | 0.004 | 2.04E-04 | -0.12 | **-0.12** |
| | 60" | 9.22E-04 | | | | | | | | | | | | | | | | | 0.004 | 2.03E-04 | -0.12 | **-0.12** |
| | 72" | 9.06E-04 | | | | | | | | | | | | | | | | | 0.004 | 2.03E-04 | -0.12 | **-0.12** |
| South America | | | | | | | | | | | | | | | | | | | | | | |
| Argentina | 36" | 7.77E-04 | | | | | | | | | | | | | | | | | 0.004 | 2.06E-04 | -0.10 | **-0.09** |
| | 48" | 7.63E-04 | | | | | | | | | | | | | | | | | 0.004 | 2.04E-04 | -0.10 | **-0.09** |
| | 60" | 7.81E-04 | | | | | | | | | | | | | | | | | 0.004 | 2.03E-04 | -0.10 | **-0.09** |
| | 72" | 7.69E-04 | | | | | | | | | | | | | | | | | 0.004 | 2.03E-04 | -0.10 | **-0.09** |
| Brazil | 36" | 7.33E-04 | | | | | | | | | | | | | | | | | 0.004 | 2.06E-04 | -0.17 | **-0.16** |
| | 48" | 7.20E-04 | | | | | | | | | | | | | | | | | 0.004 | 2.04E-04 | -0.17 | **-0.16** |
| | 60" | 7.38E-04 | | | | | | | | | | | | | | | | | 0.004 | 2.03E-04 | -0.17 | **-0.16** |
| | 72" | 7.24E-04 | | | | | | | | | | | | | | | | | 0.004 | 2.03E-04 | -0.17 | **-0.16** |
| Venezuela | 36" | 4.58E-04 | 0.005 | 2.06E-04 | -0.54 | **-0.53** | 0.005 | 2.06E-04 | -0.52 | **-0.52** | | | | | | | | | 0.004 | 2.06E-04 | -0.34 | **-0.34** |
| | 48" | 4.50E-04 | 0.006 | 2.04E-04 | -0.54 | **-0.53** | 0.006 | 2.04E-04 | -0.52 | **-0.52** | | | | | | | | | 0.004 | 2.04E-04 | -0.34 | **-0.34** |
| | 60" | 4.61E-04 | 0.006 | 2.03E-04 | -0.54 | **-0.53** | 0.006 | 2.03E-04 | -0.52 | **-0.52** | | | | | | | | | 0.004 | 2.03E-04 | -0.34 | **-0.34** |
| | 72" | 4.53E-04 | 0.005 | 2.03E-04 | -0.54 | **-0.53** | 0.005 | 2.03E-04 | -0.52 | **-0.52** | | | | | | | | | 0.004 | 2.03E-04 | -0.34 | **-0.34** |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

## 9.4 Eutrophication potential: Asia and South America (cont.)

| Eutrophication Potential (kg $PO_4$-eq/$m^2$) | | | CDA & OSW | Sentinel Silver 35 | | | | Sentinel Stainless Steel 15 | | | | Sentinel Stainless Steel 25 | | | | Sentinel Stainless Steel 40 | | | | Sentinel Stainless Steel 45 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Transportation to Customer | Manufacturing | End-of-life | Operational Energy | **Net kg $PO_4$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $PO_4$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $PO_4$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $PO_4$-eq** | Manufacturing | End-of-life | Operational Energy | **Net kg $PO_4$-eq** |
| Asia and Pacific | Australia | 36" | 1.04E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.02E-03 | 0.004 | 2.04E-04 | -0.12 | **-0.12** | | | | | | | | | | | | | | | | |
| | | 60" | 1.04E-03 | 0.004 | 2.03E-04 | -0.12 | **-0.12** | | | | | 0.004 | 2.03E-04 | -0.12 | **-0.11** | 0.004 | 2.03E-04 | -0.09 | **-0.09** | | | | |
| | | 72" | 1.03E-03 | 0.004 | 2.03E-04 | -0.12 | **-0.12** | | | | | 0.004 | 2.03E-04 | -0.12 | **-0.11** | 0.004 | 2.03E-04 | -0.09 | **-0.09** | | | | |
| | China, Mid-East Coast | 36" | 8.26E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 8.10E-04 | 0.004 | 2.04E-04 | -0.65 | **-0.65** | | | | | | | | | | | | | | | | |
| | | 60" | 8.32E-04 | 0.004 | 2.03E-04 | -0.65 | **-0.65** | 0.004 | 2.03E-04 | -0.73 | **-0.72** | 0.004 | 2.03E-04 | -0.63 | **-0.63** | | | | | | | | |
| | | 72" | 8.17E-04 | 0.004 | 2.03E-04 | -0.65 | **-0.65** | 0.004 | 2.03E-04 | -0.73 | **-0.72** | 0.004 | 2.03E-04 | -0.63 | **-0.63** | | | | | | | | |
| | North-East Asia | 36" | 8.26E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 8.10E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 60" | 8.32E-04 | | | | | 0.004 | 2.03E-04 | -0.82 | **-0.82** | 0.004 | 2.03E-04 | -0.71 | **-0.71** | | | | | | | | |
| | | 72" | 8.17E-04 | | | | | 0.004 | 2.03E-04 | -0.82 | **-0.82** | 0.004 | 2.03E-04 | -0.71 | **-0.71** | | | | | | | | |
| | China, South-East | 36" | 8.26E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 8.10E-04 | 0.004 | 2.04E-04 | -0.81 | **-0.81** | | | | | | | | | | | | | | | | |
| | | 60" | 8.32E-04 | 0.004 | 2.03E-04 | -0.81 | **-0.81** | | | | | | | | | | | | | | | | |
| | | 72" | 8.17E-04 | 0.004 | 2.03E-04 | -0.81 | **-0.81** | | | | | | | | | | | | | | | | |
| | India | 36" | | | | | | | | | | | | | | | | | | | | | |
| | | 48" | | | | | | | | | | | | | | | | | | | | | |
| | | 60" | | | | | | | | | | | | | | | | | | | | | |
| | | 72" | | | | | | | | | | | | | | | | | | | | | |
| | Japan | 36" | 7.24E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 7.10E-04 | 0.004 | 2.04E-04 | -0.51 | **-0.51** | | | | | | | | | | | | | | | | |
| | | 60" | 7.28E-04 | 0.004 | 2.03E-04 | -0.51 | **-0.51** | | | | | | | | | | | | | | | | |
| | | 72" | 7.15E-04 | 0.004 | 2.03E-04 | -0.51 | **-0.51** | | | | | | | | | | | | | | | | |
| | Malaysia | 36" | 1.11E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.09E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 60" | 1.11E-03 | | | | | 0.004 | 2.03E-04 | -0.52 | **-0.52** | | | | | | | | | | | | |
| | | 72" | 1.09E-03 | | | | | 0.004 | 2.03E-04 | -0.52 | **-0.52** | | | | | | | | | | | | |
| | Middle East | 36" | 1.08E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.06E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 60" | 1.09E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 72" | 1.07E-03 | | | | | | | | | | | | | | | | | | | | |
| | Turkey | 36" | 9.20E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 9.00E-04 | 0.004 | 2.04E-04 | -0.10 | **-0.10** | | | | | | | | | | | | | | | | |
| | | 60" | 9.22E-04 | 0.004 | 2.03E-04 | -0.10 | **-0.10** | | | | | | | | | | | | | | | | |
| | | 72" | 9.06E-04 | 0.004 | 2.03E-04 | -0.10 | **-0.10** | | | | | | | | | | | | | | | | |
| South America | Argentina | 36" | 7.77E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 7.63E-04 | 0.004 | 2.04E-04 | -0.08 | **-0.08** | | | | | | | | | | | | | | | | |
| | | 60" | 7.81E-04 | 0.004 | 2.03E-04 | -0.08 | **-0.08** | 0.004 | 2.03E-04 | -0.09 | **-0.09** | | | | | | | | | 0.004 | 2.03E-04 | -0.05 | **-0.05** |
| | | 72" | 7.69E-04 | 0.004 | 2.03E-04 | -0.08 | **-0.08** | 0.004 | 2.03E-04 | -0.09 | **-0.09** | | | | | | | | | 0.004 | 2.03E-04 | -0.05 | **-0.05** |
| | Brazil | 36" | 7.33E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 7.20E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 60" | 7.38E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 72" | 7.24E-04 | | | | | | | | | | | | | | | | | | | | |
| | Venezuela | 36" | 4.58E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 4.50E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 60" | 4.61E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 72" | 4.53E-04 | | | | | | | | | | | | | | | | | | | | |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

## 9.5 Photochemical oxidation potential: North America and Europe

| Photochemical Oxidation ($kg\ C_2H_4$-eq/$m^2$) | | | PS Series | LX 40 | | | | Hilite 40 | | | | 4 Mil Clear | Sentinel 4 Mil Clear | | | | CDA & OSW | Silver AG 50 Low-E | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Transportation to Customer | Manufacturing | End-of-Life | Operational Energy | Net $C_2H_4$-eq | Manufacturing | End-of-Life | Operational Energy | Net $C_2H_4$-eq | Transportation to Customer | Manufacturing | End-of-Life | Operational Energy | Net $C_2H_4$-eq | Transportation to Customer | Manufacturing | End-of-Life | Operational Energy | Net $C_2H_4$-eq |
| North America | ASHRAE Climate Zone 1,2 | 36" | | | | | | | | | | 1.63E-05 | 2.29E-03 | 2.08E-05 | -0.033 | **-0.031** | 9.69E-06 | 1.82E-03 | 1.04E-05 | -0.428 | **-0.426** |
| | | 48" | 1.27E-05 | | | | | 3.52E-03 | 1.55E-05 | -0.472 | **-0.468** | 1.62E-05 | 2.23E-03 | 2.07E-05 | -0.033 | **-0.031** | 9.42E-06 | 1.91E-03 | 1.03E-05 | -0.428 | **-0.426** |
| | | 60" | 1.31E-05 | | | | | 3.22E-03 | 1.54E-05 | -0.472 | **-0.468** | 1.64E-05 | 2.27E-03 | 2.06E-05 | -0.033 | **-0.031** | 9.65E-06 | 2.00E-03 | 1.21E-05 | -0.428 | **-0.425** |
| | | 72" | | | | | | | | | | 1.62E-05 | 2.28E-03 | 2.05E-05 | -0.033 | **-0.031** | 9.58E-06 | | | | |
| | ASHRAE Climate Zone 3 | 36" | | | | | | | | | | 1.63E-05 | 2.29E-03 | 2.08E-05 | -0.065 | **-0.063** | 9.69E-06 | 1.82E-03 | 1.04E-05 | -0.373 | **-0.372** |
| | | 48" | 1.27E-05 | | | | | 3.52E-03 | 1.55E-05 | -0.394 | **-0.390** | 1.62E-05 | 2.23E-03 | 2.07E-05 | -0.065 | **-0.063** | 9.42E-06 | 1.91E-03 | 1.03E-05 | -0.373 | **-0.372** |
| | | 60" | 1.31E-05 | | | | | 3.22E-03 | 1.54E-05 | -0.394 | **-0.390** | 1.64E-05 | 2.27E-03 | 2.06E-05 | -0.065 | **-0.063** | 9.65E-06 | 2.00E-03 | 1.21E-05 | -0.373 | **-0.371** |
| | | 72" | | | | | | | | | | 1.62E-05 | 2.28E-03 | 2.05E-05 | -0.065 | **-0.063** | 9.58E-06 | | | | |
| | ASHRAE Climate Zone 4 | 36" | | | | | | | | | | 1.63E-05 | 2.29E-03 | 2.08E-05 | -0.040 | **-0.037** | 9.69E-06 | 1.82E-03 | 1.04E-05 | -0.233 | **-0.231** |
| | | 48" | 1.27E-05 | | | | | 3.52E-03 | 1.55E-05 | -0.245 | **-0.241** | 1.62E-05 | 2.23E-03 | 2.07E-05 | -0.040 | **-0.037** | 9.42E-06 | 1.91E-03 | 1.03E-05 | -0.233 | **-0.231** |
| | | 60" | 1.31E-05 | | | | | 3.22E-03 | 1.54E-05 | -0.245 | **-0.241** | 1.64E-05 | 2.27E-03 | 2.06E-05 | -0.040 | **-0.037** | 9.65E-06 | 2.00E-03 | 1.21E-05 | -0.233 | **-0.231** |
| | | 72" | | | | | | | | | | 1.62E-05 | 2.28E-03 | 2.05E-05 | -0.040 | **-0.037** | 9.58E-06 | | | | |
| | ASHRAE Climate Zone 5 | 36" | | | | | | | | | | 1.63E-05 | 2.29E-03 | 2.08E-05 | -0.036 | **-0.034** | 9.69E-06 | 1.82E-03 | 1.04E-05 | -0.203 | **-0.201** |
| | | 48" | 1.27E-05 | | | | | 3.52E-03 | 1.55E-05 | -0.209 | **-0.205** | 1.62E-05 | 2.23E-03 | 2.07E-05 | -0.036 | **-0.034** | 9.42E-06 | 1.91E-03 | 1.03E-05 | -0.203 | **-0.201** |
| | | 60" | 1.31E-05 | | | | | 3.22E-03 | 1.54E-05 | -0.209 | **-0.205** | 1.64E-05 | 2.27E-03 | 2.06E-05 | -0.036 | **-0.034** | 9.65E-06 | 2.00E-03 | 1.21E-05 | -0.203 | **-0.201** |
| | | 72" | | | | | | | | | | 1.62E-05 | 2.28E-03 | 2.05E-05 | -0.036 | **-0.034** | 9.58E-06 | | | | |
| | ASHRAE Climate Zone 6,7 | 36" | | | | | | | | | | 1.63E-05 | 2.29E-03 | 2.08E-05 | -0.044 | **-0.042** | 9.69E-06 | 1.82E-03 | 1.04E-05 | -0.249 | **-0.247** |
| | | 48" | 1.27E-05 | | | | | 3.52E-03 | 1.55E-05 | -0.259 | **-0.255** | 1.62E-05 | 2.23E-03 | 2.07E-05 | -0.044 | **-0.042** | 9.42E-06 | 1.91E-03 | 1.03E-05 | -0.249 | **-0.247** |
| | | 60" | 1.31E-05 | | | | | 3.22E-03 | 1.54E-05 | -0.259 | **-0.256** | 1.64E-05 | 2.28E-03 | 2.06E-05 | -0.044 | **-0.042** | 9.65E-06 | 2.00E-03 | 1.21E-05 | -0.249 | **-0.247** |
| | | 72" | | | | | | | | | | 1.62E-05 | 2.28E-03 | 2.05E-05 | -0.044 | **-0.042** | 9.58E-06 | | | | |
| | Canada | 36" | | | | | | | | | | 5.55E-05 | | | | | 3.28E-05 | 1.82E-03 | 1.04E-05 | -0.040 | **-0.038** |
| | | 48" | 4.35E-05 | | | | | 3.52E-03 | 1.55E-05 | -0.011 | **-0.008** | 5.49E-05 | | | | | 3.21E-05 | 1.91E-03 | 1.03E-05 | -0.040 | **-0.038** |
| | | 60" | 4.43E-05 | | | | | 3.22E-03 | 1.54E-05 | -0.011 | **-0.008** | 5.56E-05 | | | | | 3.29E-05 | 2.00E-03 | 1.21E-05 | -0.040 | **-0.038** |
| | | 72" | | | | | | | | | | 5.52E-05 | | | | | 3.24E-05 | | | | |
| | Mexico | 36" | | | | | | | | | | 1.56E-05 | 2.29E-03 | 2.08E-05 | -0.032 | **-0.029** | 9.25E-06 | 1.82E-03 | 1.04E-05 | -0.170 | **-0.168** |
| | | 48" | | | | | | | | | | 1.55E-05 | 2.23E-03 | 2.07E-05 | -0.032 | **-0.029** | 9.09E-06 | 1.91E-03 | 1.03E-05 | -0.170 | **-0.168** |
| | | 60" | | | | | | | | | | 1.57E-05 | 2.27E-03 | 2.06E-05 | -0.032 | **-0.029** | 9.38E-06 | 2.00E-03 | 1.21E-05 | -0.170 | **-0.168** |
| | | 72" | | | | | | | | | | 1.56E-05 | 2.28E-03 | 2.05E-05 | -0.032 | **-0.029** | 9.14E-06 | | | | |
| Europe | France | 36" | | | | | | | | | | 1.20E-03 | 2.29E-03 | 1.62E-05 | -3.82E-03 | **-3.06E-04** | 7.09E-04 | 1.65E-03 | 9.08E-06 | -0.022 | **-0.020** |
| | | 48" | | | | | | | | | | 1.19E-03 | 2.23E-03 | 1.61E-05 | -3.82E-03 | **-3.85E-04** | 6.97E-04 | 1.91E-03 | 8.90E-06 | -0.022 | **-0.020** |
| | | 60" | | | | | | | | | | 1.21E-03 | 2.27E-03 | 1.62E-05 | -3.82E-03 | **-3.28E-04** | 7.14E-04 | 2.00E-03 | 1.03E-05 | -0.022 | **-0.019** |
| | | 72" | | | | | | | | | | 1.20E-03 | 2.28E-03 | 1.61E-05 | -3.82E-03 | **-3.23E-04** | 7.03E-04 | | | | |
| | Northern Europe | 36" | | | | | | | | | | 1.19E-03 | 2.29E-03 | 6.51E-06 | -4.42E-03 | **-9.29E-04** | 7.07E-04 | 1.82E-03 | 5.32E-06 | -0.045 | **-0.043** |
| | | 48" | 9.33E-04 | | | | | | | | | 1.18E-03 | 2.23E-03 | 6.27E-06 | -4.42E-03 | **-1.01E-03** | 6.91E-04 | 1.91E-03 | 5.08E-06 | -0.045 | **-0.043** |
| | | 60" | 9.52E-04 | 3.22E-03 | 6.00E-06 | -0.024 | **-0.020** | | | | | 1.20E-03 | 2.27E-03 | 6.60E-06 | -4.42E-03 | **-9.51E-04** | 7.09E-04 | 2.00E-03 | 5.62E-06 | -0.045 | **-0.043** |
| | | 72" | | | | | | | | | | 1.19E-03 | 2.28E-03 | 6.42E-06 | -4.42E-03 | **-9.44E-04** | 6.97E-04 | | | | |
| | Russia | 36" | | | | | | | | | | | | | | | 7.44E-04 | | | | |
| | | 48" | | | | | | | | | | | | | | | 7.29E-04 | | | | |
| | | 60" | | | | | | | | | | | | | | | 7.47E-04 | | | | |
| | | 72" | | | | | | | | | | | | | | | 7.34E-04 | | | | |
| | Scandivania | 36" | | | | | | | | | | 1.17E-03 | 2.29E-03 | 1.63E-05 | -2.70E-03 | **7.82E-04** | 6.93E-04 | 1.82E-03 | 9.81E-06 | -0.038 | **-0.036** |
| | | 48" | 9.15E-04 | | | | | | | | | 1.15E-03 | 2.23E-03 | 1.61E-05 | -2.70E-03 | **7.04E-04** | 6.77E-04 | 1.91E-03 | 9.59E-06 | -0.038 | **-0.036** |
| | | 60" | 9.34E-04 | 3.22E-03 | 1.31E-05 | -7.13E-03 | **-2.96E-03** | | | | | 1.17E-03 | 2.27E-03 | 1.64E-05 | -2.70E-03 | **7.60E-04** | 6.95E-04 | 2.00E-03 | 1.10E-05 | -0.038 | **-0.035** |
| | | 72" | | | | | | | | | | 1.16E-03 | 2.28E-03 | 1.62E-05 | -2.70E-03 | **7.66E-04** | 6.83E-04 | | | | |
| | Southern Europe | 36" | | | | | | | | | | 1.19E-03 | 2.29E-03 | 6.51E-06 | -0.039 | **-0.036** | 7.07E-04 | | | | |
| | | 48" | | | | | | | | | | 1.18E-03 | 2.23E-03 | 6.27E-06 | -0.039 | **-0.036** | 6.91E-04 | | | | |
| | | 60" | | | | | | | | | | 1.20E-03 | 2.27E-03 | 6.60E-06 | -0.039 | **-0.036** | 7.09E-04 | | | | |
| | | 72" | | | | | | | | | | 1.19E-03 | 2.28E-03 | 6.42E-06 | -0.039 | **-0.036** | 6.99E-04 | | | | |
| | United Kingdom | 36" | | | | | | | | | | 1.14E-03 | 2.29E-03 | 2.16E-05 | -5.22E-03 | **-1.77E-03** | 6.73E-04 | 1.82E-03 | 1.07E-05 | -0.052 | **-0.049** |
| | | 48" | 8.90E-04 | | | | | | | | | 1.12E-03 | 2.23E-03 | 2.15E-05 | -5.22E-03 | **-1.84E-03** | 6.58E-04 | 1.91E-03 | 1.06E-05 | -0.052 | **-0.049** |
| | | 60" | 9.08E-04 | 3.21E-03 | 1.60E-05 | -0.045 | **-0.041** | | | | | 1.14E-03 | 2.27E-03 | 2.15E-05 | -5.22E-03 | **-1.79E-03** | 6.74E-04 | 2.00E-03 | 1.57E-05 | -0.052 | **-0.049** |
| | | 72" | | | | | | | | | | 1.13E-03 | 2.28E-03 | 2.14E-05 | -5.22E-03 | **-1.78E-03** | 6.64E-04 | | | | |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

## 9.5 Photochemical oxidation potential: North America and Europe (cont.)

| Photochemical Oxidation ($kg\ C_2H_4$-eq/$m^2$) | | | CDA & OSW | TrueVue 5 | | | | TrueVue 15 | | | | TrueVue 30 | | | | TrueVue 40 | | | | Sentinel Silver 20 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Transportation to Customer | Manufacturing | End-of-Life | Operational Energy | **Net $C_2H_4$-eq** | Manufacturing | End-of-Life | Operational Energy | **Net $C_2H_4$-eq** | Manufacturing | End-of-Life | Operational Energy | **Net $C_2H_4$-eq** | Manufacturing | End-of-Life | Operational Energy | **Net $C_2H_4$-eq** | Manufacturing | End-of-Life | Operational Energy | **Net $C_2H_4$-eq** |
| North America | ASHRAE Climate Zone 1,2 | 36" | 9.69E-06 | 1.99E-03 | 1.04E-05 | -0.694 | **-0.692** | 1.98E-03 | 1.04E-05 | -0.671 | **-0.669** | 1.92E-03 | 1.04E-05 | -0.477 | **-0.475** | 1.90E-03 | 1.04E-05 | -0.373 | **-0.372** | 1.90E-03 | 1.04E-05 | -0.369 | **-0.367** |
| | | 48" | 9.42E-06 | 2.00E-03 | 1.03E-05 | -0.694 | **-0.692** | 2.00E-03 | 1.03E-05 | -0.671 | **-0.669** | 1.91E-03 | 1.03E-05 | -0.477 | **-0.475** | 1.89E-03 | 1.03E-05 | -0.373 | **-0.372** | 1.87E-03 | 1.03E-05 | -0.369 | **-0.367** |
| | | 60" | 9.65E-06 | 2.00E-03 | 1.03E-05 | -0.694 | **-0.692** | 2.00E-03 | 1.03E-05 | -0.671 | **-0.669** | 1.93E-03 | 1.03E-05 | -0.477 | **-0.475** | 1.92E-03 | 1.03E-05 | -0.373 | **-0.372** | 1.91E-03 | 1.03E-05 | -0.369 | **-0.367** |
| | | 72" | 9.58E-06 | 1.97E-03 | 1.02E-05 | -0.694 | **-0.692** | 1.97E-03 | 1.02E-05 | -0.671 | **-0.669** | 1.91E-03 | 1.02E-05 | -0.477 | **-0.475** | 1.90E-03 | 1.02E-05 | -0.373 | **-0.372** | 1.89E-03 | 1.02E-05 | -0.369 | **-0.367** |
| | ASHRAE Climate Zone 3 | 36" | 9.69E-06 | 1.99E-03 | 1.04E-05 | -0.575 | **-0.573** | 1.98E-03 | 1.04E-05 | -0.561 | **-0.559** | 1.92E-03 | 1.04E-05 | -0.402 | **-0.400** | 1.90E-03 | 1.04E-05 | -0.321 | **-0.319** | 1.90E-03 | 1.04E-05 | -0.347 | **-0.345** |
| | | 48" | 9.42E-06 | 2.00E-03 | 1.03E-05 | -0.575 | **-0.573** | 2.00E-03 | 1.03E-05 | -0.561 | **-0.559** | 1.91E-03 | 1.03E-05 | -0.402 | **-0.400** | 1.89E-03 | 1.03E-05 | -0.321 | **-0.319** | 1.87E-03 | 1.03E-05 | -0.347 | **-0.345** |
| | | 60" | 9.65E-06 | 2.00E-03 | 1.03E-05 | -0.575 | **-0.573** | 2.00E-03 | 1.03E-05 | -0.561 | **-0.559** | 1.93E-03 | 1.03E-05 | -0.402 | **-0.400** | 1.92E-03 | 1.03E-05 | -0.321 | **-0.319** | 1.90E-03 | 1.03E-05 | -0.347 | **-0.345** |
| | | 72" | 9.58E-06 | 1.97E-03 | 1.02E-05 | -0.575 | **-0.573** | 1.97E-03 | 1.02E-05 | -0.561 | **-0.559** | 1.91E-03 | 1.02E-05 | -0.402 | **-0.400** | 1.90E-03 | 1.02E-05 | -0.321 | **-0.319** | 1.89E-03 | 1.02E-05 | -0.347 | **-0.345** |
| | ASHRAE Climate Zone 4 | 36" | 9.69E-06 | 1.99E-03 | 1.04E-05 | -0.347 | **-0.345** | 1.98E-03 | 1.04E-05 | -0.338 | **-0.336** | 1.92E-03 | 1.04E-05 | -0.249 | **-0.247** | 1.90E-03 | 1.04E-05 | -0.196 | **-0.195** | 1.90E-03 | 1.04E-05 | -0.206 | **-0.205** |
| | | 48" | 9.42E-06 | 2.00E-03 | 1.03E-05 | -0.347 | **-0.345** | 2.00E-03 | 1.03E-05 | -0.338 | **-0.336** | 1.91E-03 | 1.03E-05 | -0.249 | **-0.247** | 1.89E-03 | 1.03E-05 | -0.196 | **-0.195** | 1.87E-03 | 1.03E-05 | -0.206 | **-0.205** |
| | | 60" | 9.65E-06 | 2.00E-03 | 1.03E-05 | -0.347 | **-0.345** | 2.00E-03 | 1.03E-05 | -0.338 | **-0.336** | 1.93E-03 | 1.03E-05 | -0.249 | **-0.247** | 1.92E-03 | 1.03E-05 | -0.196 | **-0.195** | 1.90E-03 | 1.03E-05 | -0.206 | **-0.205** |
| | | 72" | 9.58E-06 | 1.97E-03 | 1.02E-05 | -0.347 | **-0.345** | 1.97E-03 | 1.02E-05 | -0.338 | **-0.336** | 1.91E-03 | 1.02E-05 | -0.249 | **-0.247** | 1.90E-03 | 1.02E-05 | -0.196 | **-0.195** | 1.89E-03 | 1.02E-05 | -0.206 | **-0.205** |
| | ASHRAE Climate Zone 5 | 36" | 9.69E-06 | 1.99E-03 | 1.04E-05 | -0.282 | **-0.280** | 1.98E-03 | 1.04E-05 | -0.277 | **-0.275** | 1.92E-03 | 1.04E-05 | -0.208 | **-0.206** | 1.90E-03 | 1.04E-05 | -0.170 | **-0.168** | 1.90E-03 | 1.04E-05 | -0.163 | **-0.161** |
| | | 48" | 9.42E-06 | 2.00E-03 | 1.03E-05 | -0.282 | **-0.280** | 2.00E-03 | 1.03E-05 | -0.277 | **-0.275** | 1.91E-03 | 1.03E-05 | -0.208 | **-0.206** | 1.89E-03 | 1.03E-05 | -0.170 | **-0.168** | 1.87E-03 | 1.03E-05 | -0.163 | **-0.161** |
| | | 60" | 9.65E-06 | 2.00E-03 | 1.03E-05 | -0.282 | **-0.280** | 2.00E-03 | 1.03E-05 | -0.277 | **-0.275** | 1.93E-03 | 1.03E-05 | -0.208 | **-0.206** | 1.92E-03 | 1.03E-05 | -0.170 | **-0.168** | 1.90E-03 | 1.03E-05 | -0.163 | **-0.161** |
| | | 72" | 9.58E-06 | 1.97E-03 | 1.02E-05 | -0.282 | **-0.280** | 1.97E-03 | 1.02E-05 | -0.277 | **-0.275** | 1.91E-03 | 1.02E-05 | -0.208 | **-0.206** | 1.90E-03 | 1.02E-05 | -0.170 | **-0.168** | 1.89E-03 | 1.02E-05 | -0.163 | **-0.161** |
| | ASHRAE Climate Zone 6,7 | 36" | 9.69E-06 | 1.99E-03 | 1.04E-05 | -0.353 | **-0.351** | 1.98E-03 | 1.04E-05 | -0.341 | **-0.339** | 1.92E-03 | 1.04E-05 | -0.262 | **-0.260** | 1.90E-03 | 1.04E-05 | -0.215 | **-0.213** | 1.90E-03 | 1.04E-05 | -0.203 | **-0.201** |
| | | 48" | 9.42E-06 | 2.00E-03 | 1.03E-05 | -0.353 | **-0.351** | 2.00E-03 | 1.03E-05 | -0.341 | **-0.339** | 1.91E-03 | 1.03E-05 | -0.262 | **-0.260** | 1.89E-03 | 1.03E-05 | -0.215 | **-0.213** | 1.87E-03 | 1.03E-05 | -0.203 | **-0.201** |
| | | 60" | 9.65E-06 | 2.00E-03 | 1.03E-05 | -0.353 | **-0.351** | 2.00E-03 | 1.03E-05 | -0.341 | **-0.339** | 1.93E-03 | 1.03E-05 | -0.262 | **-0.260** | 1.92E-03 | 1.03E-05 | -0.215 | **-0.213** | 1.90E-03 | 1.03E-05 | -0.203 | **-0.201** |
| | | 72" | 9.58E-06 | 1.97E-03 | 1.02E-05 | -0.353 | **-0.351** | 1.97E-03 | 1.02E-05 | -0.341 | **-0.339** | 1.91E-03 | 1.02E-05 | -0.262 | **-0.260** | 1.90E-03 | 1.02E-05 | -0.215 | **-0.213** | 1.89E-03 | 1.02E-05 | -0.203 | **-0.201** |
| | Canada | 36" | 3.28E-05 | 1.99E-03 | 1.04E-05 | -4.05E-03 | **-2.01E-03** | 1.98E-03 | 1.04E-05 | -8.44E-03 | **-6.42E-03** | 1.92E-03 | 1.04E-05 | -1.01E-02 | **-8.10E-03** | 1.90E-03 | 1.04E-05 | -8.38E-03 | **-6.43E-03** | 1.90E-03 | 1.04E-05 | 0.013 | **0.015** |
| | | 48" | 3.21E-05 | 2.00E-03 | 1.03E-05 | -4.05E-03 | **-2.01E-03** | 2.00E-03 | 1.03E-05 | -8.44E-03 | **-6.39E-03** | 1.91E-03 | 1.03E-05 | -1.01E-02 | **-8.11E-03** | 1.89E-03 | 1.03E-05 | -8.38E-03 | **-6.44E-03** | 1.87E-03 | 1.03E-05 | 0.013 | **0.015** |
| | | 60" | 3.29E-05 | 2.00E-03 | 1.03E-05 | -4.05E-03 | **-2.01E-03** | 2.00E-03 | 1.03E-05 | -8.44E-03 | **-6.39E-03** | 1.93E-03 | 1.03E-05 | -1.01E-02 | **-8.09E-03** | 1.92E-03 | 1.03E-05 | -8.38E-03 | **-6.42E-03** | 1.90E-03 | 1.03E-05 | 0.013 | **0.015** |
| | | 72" | 3.24E-05 | 1.97E-03 | 1.02E-05 | -4.05E-03 | **-2.03E-03** | 1.97E-03 | 1.02E-05 | -8.44E-03 | **-6.43E-03** | 1.91E-03 | 1.02E-05 | -1.01E-02 | **-8.11E-03** | 1.90E-03 | 1.02E-05 | -8.38E-03 | **-6.44E-03** | 1.89E-03 | 1.02E-05 | 0.013 | **0.015** |
| | Mexico | 36" | 9.25E-06 | | | | | | | | | | | | | | | | | 1.90E-03 | 1.04E-05 | -0.172 | **-0.170** |
| | | 48" | 9.09E-06 | | | | | | | | | | | | | | | | | 1.87E-03 | 1.03E-05 | -0.172 | **-0.170** |
| | | 60" | 9.38E-06 | | | | | | | | | | | | | | | | | 1.90E-03 | 1.03E-05 | -0.172 | **-0.170** |
| | | 72" | 9.14E-06 | | | | | | | | | | | | | | | | | 1.89E-03 | 1.02E-05 | -0.172 | **-0.170** |
| Europe | France | 36" | 7.09E-04 | | | | | | | | | | | | | | | | | 1.90E-03 | 9.08E-06 | -0.012 | **-9.55E-03** |
| | | 48" | 6.97E-04 | | | | | | | | | | | | | | | | | 1.87E-03 | 8.90E-06 | -0.012 | **-9.59E-03** |
| | | 60" | 7.14E-04 | | | | | | | | | | | | | | | | | 1.90E-03 | 9.07E-06 | -0.012 | **-9.55E-03** |
| | | 72" | 7.03E-04 | | | | | | | | | | | | | | | | | 1.89E-03 | 8.96E-06 | -0.012 | **-9.56E-03** |
| | Northern Europe | 36" | 7.07E-04 | | | | | | | | | | | | | | | | | 1.90E-03 | 5.32E-06 | -7.89E-03 | **-5.28E-03** |
| | | 48" | 6.91E-04 | | | | | | | | | | | | | | | | | 1.87E-03 | 5.08E-06 | -7.89E-03 | **-5.32E-03** |
| | | 60" | 7.09E-04 | | | | | | | | | | | | | | | | | 1.90E-03 | 5.41E-06 | -7.89E-03 | **-5.28E-03** |
| | | 72" | 6.97E-04 | | | | | | | | | | | | | | | | | 1.89E-03 | 5.23E-06 | -7.89E-03 | **-5.30E-03** |
| | Russia | 36" | 7.44E-04 | | | | | | | | | | | | | | | | | 1.90E-03 | 1.04E-05 | 0.029 | **0.031** |
| | | 48" | 7.29E-04 | | | | | | | | | | | | | | | | | 1.87E-03 | 1.03E-05 | 0.029 | **0.031** |
| | | 60" | 7.47E-04 | | | | | | | | | | | | | | | | | 1.90E-03 | 1.03E-05 | 0.029 | **0.031** |
| | | 72" | 7.34E-04 | | | | | | | | | | | | | | | | | 1.89E-03 | 1.02E-05 | 0.029 | **0.031** |
| | Scandivania | 36" | 6.93E-04 | 1.99E-03 | 9.81E-06 | 2.05E-03 | **4.75E-03** | 1.98E-03 | 9.81E-06 | -3.36E-03 | **-6.84E-04** | | | | | | | | | 1.90E-03 | 9.81E-06 | 6.25E-03 | **8.86E-03** |
| | | 48" | 6.77E-04 | 2.00E-03 | 9.59E-06 | 2.05E-03 | **4.74E-03** | 2.00E-03 | 9.59E-06 | -3.36E-03 | **-6.74E-04** | | | | | | | | | 1.87E-03 | 9.59E-06 | 6.25E-03 | **8.81E-03** |
| | | 60" | 6.95E-04 | 2.00E-03 | 9.88E-06 | 2.05E-03 | **4.76E-03** | 2.00E-03 | 9.88E-06 | -3.36E-03 | **-6.57E-04** | | | | | | | | | 1.90E-03 | 9.88E-06 | 6.25E-03 | **8.85E-03** |
| | | 72" | 6.83E-04 | 1.97E-03 | 9.72E-06 | 2.05E-03 | **4.72E-03** | 1.97E-03 | 9.72E-06 | -3.36E-03 | **-7.01E-04** | | | | | | | | | 1.89E-03 | 9.72E-06 | 6.25E-03 | **8.84E-03** |
| | Southern Europe | 36" | 7.07E-04 | | | | | | | | | | | | | | | | | 1.90E-03 | 5.32E-06 | -0.201 | **-0.198** |
| | | 48" | 6.91E-04 | | | | | | | | | | | | | | | | | 1.87E-03 | 5.08E-06 | -0.201 | **-0.198** |
| | | 60" | 7.09E-04 | | | | | | | | | | | | | | | | | 1.90E-03 | 5.41E-06 | -0.201 | **-0.198** |
| | | 72" | 6.99E-04 | | | | | | | | | | | | | | | | | 1.89E-03 | 5.23E-06 | -0.201 | **-0.198** |
| | United Kingdom | 36" | 6.73E-04 | 1.99E-03 | 1.07E-05 | -0.054 | **-0.052** | 1.98E-03 | 1.07E-05 | -0.057 | **-0.054** | 1.92E-03 | 1.07E-05 | -0.047 | **-0.045** | 1.90E-03 | 1.07E-05 | -0.037 | **-0.034** | 1.90E-03 | 1.07E-05 | -0.035 | **-0.032** |
| | | 48" | 6.58E-04 | 2.00E-03 | 1.06E-05 | -0.054 | **-0.052** | 2.00E-03 | 1.06E-05 | -0.057 | **-0.054** | 1.91E-03 | 1.06E-05 | -0.047 | **-0.045** | 1.89E-03 | 1.06E-05 | -0.037 | **-0.034** | 1.87E-03 | 1.06E-05 | -0.035 | **-0.032** |
| | | 60" | 6.74E-04 | 2.00E-03 | 1.06E-05 | -0.054 | **-0.052** | 2.00E-03 | 1.06E-05 | -0.057 | **-0.054** | 1.93E-03 | 1.06E-05 | -0.047 | **-0.045** | 1.92E-03 | 1.06E-05 | -0.037 | **-0.034** | 1.90E-03 | 1.06E-05 | -0.035 | **-0.032** |
| | | 72" | 6.64E-04 | 1.97E-03 | 1.06E-05 | -0.054 | **-0.052** | 1.97E-03 | 1.06E-05 | -0.057 | **-0.054** | 1.91E-03 | 1.06E-05 | -0.047 | **-0.045** | 1.90E-03 | 1.06E-05 | -0.037 | **-0.034** | 1.89E-03 | 1.06E-05 | -0.035 | **-0.032** |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

## 9.5 Photochemical oxidation potential: North America and Europe (cont.)

| Photochemical Oxidation ($kg\ C_2H_4$-eq/$m^2$) | | CDA & OSW Transportation to Customer | Sentinel Silver 35 | | | | Sentinel Stainless Steel 15 | | | | Sentinel Stainless Steel 25 | | | | Sentinel Stainless Steel 40 | | | | Sentinel Stainless Steel 45 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Manufacturing | End-of-Life | Operational Energy | **Net $C_2H_4$-eq** | Manufacturing | End-of-Life | Operational Energy | **Net $C_2H_4$-eq** | Manufacturing | End-of-Life | Operational Energy | **Net $C_2H_4$-eq** | Manufacturing | End-of-Life | Operational Energy | **Net $C_2H_4$-eq** | Manufacturing | End-of-Life | Operational Energy | **Net $C_2H_4$-eq** |
| North America | ASHRAE Climate Zone 1,2 | 36" | 9.69E-06 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 9.42E-06 | 1.86E-03 | 1.03E-05 | -0.292 | **-0.290** | | | | | | | | | | | | | | | |
| | | 60" | 9.65E-06 | 1.89E-03 | 1.03E-05 | -0.292 | **-0.290** | 1.93E-03 | 1.03E-05 | -0.323 | **-0.321** | 1.90E-03 | 1.03E-05 | -0.271 | **-0.269** | 1.89E-03 | 1.03E-05 | -0.202 | **-0.200** | 1.89E-03 | 1.03E-05 | -0.172 | **-0.170** |
| | | 72" | 9.58E-06 | 1.88E-03 | 1.02E-05 | -0.292 | **-0.290** | 1.92E-03 | 1.02E-05 | -0.323 | **-0.321** | 1.90E-03 | 1.02E-05 | -0.271 | **-0.269** | 1.89E-03 | 1.02E-05 | -0.202 | **-0.200** | 1.89E-03 | 1.02E-05 | -0.172 | **-0.170** |
| | ASHRAE Climate Zone 3 | 36" | 9.69E-06 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 9.42E-06 | 1.86E-03 | 1.03E-05 | -0.295 | **-0.293** | | | | | | | | | | | | | | | |
| | | 60" | 9.65E-06 | 1.89E-03 | 1.03E-05 | -0.295 | **-0.293** | 1.93E-03 | 1.03E-05 | -0.330 | **-0.328** | 1.90E-03 | 1.03E-05 | -0.286 | **-0.284** | 1.89E-03 | 1.03E-05 | -0.223 | **-0.221** | 1.89E-03 | 1.03E-05 | -0.197 | **-0.195** |
| | | 72" | 9.58E-06 | 1.88E-03 | 1.02E-05 | -0.295 | **-0.293** | 1.92E-03 | 1.02E-05 | -0.330 | **-0.328** | 1.90E-03 | 1.02E-05 | -0.286 | **-0.284** | 1.89E-03 | 1.02E-05 | -0.223 | **-0.221** | 1.89E-03 | 1.02E-05 | -0.197 | **-0.195** |
| | ASHRAE Climate Zone 4 | 36" | 9.69E-06 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 9.42E-06 | 1.86E-03 | 1.03E-05 | -0.173 | **-0.172** | | | | | | | | | | | | | | | |
| | | 60" | 9.65E-06 | 1.89E-03 | 1.03E-05 | -0.173 | **-0.171** | 1.93E-03 | 1.03E-05 | -0.193 | **-0.191** | 1.90E-03 | 1.03E-05 | -0.170 | **-0.168** | 1.89E-03 | 1.03E-05 | -0.135 | **-0.133** | 1.89E-03 | 1.03E-05 | -0.120 | **-0.119** |
| | | 72" | 9.58E-06 | 1.88E-03 | 1.02E-05 | -0.173 | **-0.171** | 1.92E-03 | 1.02E-05 | -0.193 | **-0.191** | 1.90E-03 | 1.02E-05 | -0.170 | **-0.168** | 1.89E-03 | 1.02E-05 | -0.135 | **-0.133** | 1.89E-03 | 1.02E-05 | -0.120 | **-0.119** |
| | ASHRAE Climate Zone 5 | 36" | 9.69E-06 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 9.42E-06 | 1.86E-03 | 1.03E-05 | -0.141 | **-0.139** | | | | | | | | | | | | | | | |
| | | 60" | 9.65E-06 | 1.89E-03 | 1.03E-05 | -0.141 | **-0.139** | 1.93E-03 | 1.03E-05 | -0.155 | **-0.153** | 1.90E-03 | 1.03E-05 | -0.139 | **-0.137** | 1.89E-03 | 1.03E-05 | -0.114 | **-0.112** | 1.89E-03 | 1.03E-05 | -0.102 | **-0.100** |
| | | 72" | 9.58E-06 | 1.88E-03 | 1.02E-05 | -0.141 | **-0.139** | 1.92E-03 | 1.02E-05 | -0.155 | **-0.153** | 1.90E-03 | 1.02E-05 | -0.139 | **-0.137** | 1.89E-03 | 1.02E-05 | -0.114 | **-0.112** | 1.89E-03 | 1.02E-05 | -0.102 | **-0.100** |
| | ASHRAE Climate Zone 6,7 | 36" | 9.69E-06 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 9.42E-06 | 1.86E-03 | 1.03E-05 | -0.178 | **-0.176** | | | | | | | | | | | | | | | |
| | | 60" | 9.65E-06 | 1.89E-03 | 1.03E-05 | -0.178 | **-0.176** | 1.93E-03 | 1.03E-05 | -0.193 | **-0.191** | 1.90E-03 | 1.03E-05 | -0.172 | **-0.170** | 1.89E-03 | 1.03E-05 | -0.141 | **-0.139** | 1.89E-03 | 1.03E-05 | -0.125 | **-0.123** |
| | | 72" | 9.58E-06 | 1.88E-03 | 1.02E-05 | -0.178 | **-0.176** | 1.92E-03 | 1.02E-05 | -0.193 | **-0.191** | 1.90E-03 | 1.02E-05 | -0.172 | **-0.170** | 1.89E-03 | 1.02E-05 | -0.141 | **-0.139** | 1.89E-03 | 1.02E-05 | -0.125 | **-0.123** |
| | Canada | 36" | 3.28E-05 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 3.21E-05 | | | | | | | | | | | | | | | | | | | |
| | | 60" | 3.29E-05 | | | | | 1.93E-03 | 1.03E-05 | 5.97E-03 | **7.95E-03** | 1.90E-03 | 1.03E-05 | 7.05E-04 | **2.65E-03** | 1.89E-03 | 1.03E-05 | -2.45E-03 | **-5.14E-04** | 1.89E-03 | 1.03E-05 | -3.67E-03 | **-1.74E-03** |
| | | 72" | 3.24E-05 | | | | | 1.92E-03 | 1.02E-05 | 5.97E-03 | **7.94E-03** | 1.90E-03 | 1.02E-05 | 7.05E-04 | **2.65E-03** | 1.89E-03 | 1.02E-05 | -2.45E-03 | **-5.17E-04** | 1.89E-03 | 1.02E-05 | -3.67E-03 | **-1.74E-03** |
| | Mexico | 36" | 9.25E-06 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 9.09E-06 | 1.86E-03 | 1.03E-05 | -0.140 | **-0.138** | | | | | | | | | | | | | | | |
| | | 60" | 9.38E-06 | 1.89E-03 | 1.03E-05 | -0.140 | **-0.138** | | | | | | | | | | | | | 1.89E-03 | 1.03E-05 | -0.093 | **-0.092** |
| | | 72" | 9.14E-06 | 1.88E-03 | 1.02E-05 | -0.140 | **-0.138** | | | | | | | | | | | | | 1.89E-03 | 1.02E-05 | -0.093 | **-0.092** |
| Europe | France | 36" | 7.09E-04 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 6.97E-04 | 1.86E-03 | 8.90E-06 | -0.011 | **-8.76E-03** | | | | | | | | | | | | | | | |
| | | 60" | 7.14E-04 | 1.89E-03 | 9.07E-06 | -0.011 | **-8.71E-03** | 1.93E-03 | 9.07E-06 | -0.012 | **-9.50E-03** | 1.90E-03 | 9.07E-06 | -0.012 | **-9.31E-03** | 1.89E-03 | 9.07E-06 | -9.80E-03 | **-7.19E-03** | 1.89E-03 | 9.07E-06 | -9.56E-03 | **-6.95E-03** |
| | | 72" | 7.03E-04 | 1.88E-03 | 8.96E-06 | -0.011 | **-8.73E-03** | 1.92E-03 | 8.96E-06 | -0.012 | **-9.52E-03** | 1.90E-03 | 8.96E-06 | -0.012 | **-9.33E-03** | 1.89E-03 | 8.96E-06 | -9.80E-03 | **-7.20E-03** | 1.89E-03 | 8.96E-06 | -9.56E-03 | **-6.96E-03** |
| | Northern Europe | 36" | 7.07E-04 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 6.91E-04 | 1.86E-03 | 5.08E-06 | -7.97E-03 | **-5.42E-03** | | | | | | | | | | | | | | | |
| | | 60" | 7.09E-04 | 1.96E-03 | 5.62E-06 | -7.97E-03 | **-5.30E-03** | 1.93E-03 | 5.41E-06 | -8.55E-03 | **-5.91E-03** | 1.90E-03 | 5.41E-06 | -0.012 | **-9.57E-03** | 1.89E-03 | 5.41E-06 | -0.010 | **-7.59E-03** | 1.89E-03 | 5.41E-06 | -0.011 | **-8.14E-03** |
| | | 72" | 6.97E-04 | 1.88E-03 | 5.23E-06 | -7.97E-03 | **-5.39E-03** | 1.92E-03 | 5.23E-06 | -8.55E-03 | **-5.93E-03** | 1.90E-03 | 5.23E-06 | -0.012 | **-9.59E-03** | 1.89E-03 | 5.23E-06 | -0.010 | **-7.61E-03** | 1.89E-03 | 5.23E-06 | -0.011 | **-8.16E-03** |
| | Russia | 36" | 7.44E-04 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 7.29E-04 | | | | | | | | | | | | | | | | | | | |
| | | 60" | 7.47E-04 | | | | | | | | | | | | | | | | | | | |
| | | 72" | 7.34E-04 | | | | | | | | | | | | | | | | | | | |
| | Scandivania | 36" | 6.93E-04 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 6.77E-04 | 1.86E-03 | 9.59E-06 | -1.35E-04 | **2.41E-03** | | | | | | | | | | | | | | | |
| | | 60" | 6.95E-04 | 1.89E-03 | 9.88E-06 | -1.35E-04 | **2.46E-03** | 1.93E-03 | 9.88E-06 | 1.58E-03 | **4.21E-03** | 1.90E-03 | 9.88E-06 | 9.53E-05 | **2.70E-03** | 1.89E-03 | 9.88E-06 | -3.98E-04 | **2.20E-03** | 1.89E-03 | 9.88E-06 | 3.10E-04 | **2.90E-03** |
| | | 72" | 6.83E-04 | 1.88E-03 | 9.72E-06 | -1.35E-04 | **2.44E-03** | 1.92E-03 | 9.72E-06 | 1.58E-03 | **4.19E-03** | 1.90E-03 | 9.72E-06 | 9.53E-05 | **2.69E-03** | 1.89E-03 | 1.03E-05 | -3.98E-04 | **2.18E-03** | 1.89E-03 | 9.72E-06 | 3.10E-04 | **2.89E-03** |
| | Southern Europe | 36" | 7.07E-04 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 6.91E-04 | 1.86E-03 | 5.08E-06 | -0.168 | **-0.165** | | | | | | | | | | | | | | | |
| | | 60" | 7.09E-04 | 1.89E-03 | 5.41E-06 | -0.168 | **-0.165** | 1.93E-03 | 5.41E-06 | -0.186 | **-0.183** | 1.90E-03 | 5.41E-06 | -0.163 | **-0.160** | 1.89E-03 | 5.41E-06 | -0.128 | **-0.125** | 1.89E-03 | 5.41E-06 | -0.113 | **-0.111** |
| | | 72" | 6.99E-04 | 1.88E-03 | 5.23E-06 | -0.168 | **-0.165** | 1.92E-03 | 5.23E-06 | -0.186 | **-0.184** | 1.90E-03 | 5.23E-06 | -0.163 | **-0.160** | 1.89E-03 | 5.23E-06 | -0.128 | **-0.125** | 1.88E-03 | 5.23E-06 | -0.113 | **-0.111** |
| | United Kingdom | 36" | 6.73E-04 | | | | | | | | | | | | | | | | | | | |
| | | 48" | 6.58E-04 | 1.86E-03 | 1.06E-05 | -0.028 | **-0.026** | | | | | | | | | | | | | | | |
| | | 60" | 6.74E-04 | 1.89E-03 | 1.06E-05 | -0.028 | **-0.026** | 1.93E-03 | 1.06E-05 | -0.033 | **-0.030** | 1.90E-03 | 1.06E-05 | -0.024 | **-0.022** | 1.89E-03 | 1.06E-05 | -0.025 | **-0.023** | 1.89E-03 | 1.06E-05 | -0.021 | **-0.019** |
| | | 72" | 6.64E-04 | 1.88E-03 | 1.06E-05 | -0.028 | **-0.026** | 1.92E-03 | 1.06E-05 | -0.033 | **-0.030** | 1.90E-03 | 1.36E-05 | -0.024 | **-0.022** | 1.89E-03 | 1.06E-05 | -0.025 | **-0.023** | 1.89E-03 | 1.06E-05 | -0.021 | **-0.019** |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

## 9.5 Photochemical oxidation potential: Asia and South America

| Photochemical Oxidation ($kg\ C_2H_4$-eq/$m^2$) | | PS Series | LX 40 | | | | Hilite 40 | | | | 4 Mil Clear | Sentinel 4 Mil Clear | | | | CDA & OSW | Silver AG 50 Low-E | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Transportation to Customer | Manufacturing | End-of-Life | Operational Energy | **Net $C_2H_4$-eq** | Manufacturing | End-of-Life | Operational Energy | **Net $C_2H_4$-eq** | Transportation to Customer | Manufacturing | End-of-Life | Operational Energy | **Net $C_2H_4$-eq** | Transportation to Customer | Manufacturing | End-of-Life | Operational Energy | **Net $C_2H_4$-eq** |
| Asia and Pacific | | | | | | | | | | | | | | | | | | | | |
| Australia | 36" | | | | | | | | | | 1.67E-03 | 2.29E-03 | 2.08E-05 | -0.032 | **-0.028** | 9.86E-04 | 1.82E-03 | 1.04E-05 | -0.172 | **-0.169** |
| | 48" | | | | | | | | | | 1.65E-03 | 2.23E-03 | 2.07E-05 | -0.032 | **-0.028** | 9.65E-04 | 1.91E-03 | 1.03E-05 | -0.172 | **-0.169** |
| | 60" | | | | | | | | | | 1.67E-03 | 2.27E-03 | 2.06E-05 | -0.032 | **-0.028** | 9.88E-04 | 2.00E-03 | 1.21E-05 | -0.172 | **-0.169** |
| | 72" | | | | | | | | | | 1.66E-03 | 2.28E-03 | 2.05E-05 | -0.032 | **-0.028** | 9.74E-04 | | | | |
| China, Mid-East Coast | 36" | | | | | | | | | | 1.30E-03 | | | | | 7.69E-04 | | | | |
| | 48" | | | | | | | | | | 1.29E-03 | | | | | 7.53E-04 | | | | |
| | 60" | | | | | | | | | | 1.31E-03 | | | | | 7.74E-04 | | | | |
| | 72" | | | | | | | | | | 1.29E-03 | | | | | 7.61E-04 | | | | |
| North-East Asia | 36" | | | | | | | | | | 1.30E-03 | | | | | 7.69E-04 | 1.82E-03 | 1.04E-05 | -0.385 | **-0.382** |
| | 48" | | | | | | | | | | 1.29E-03 | | | | | 7.53E-04 | 1.91E-03 | 1.03E-05 | -0.385 | **-0.382** |
| | 60" | | | | | | | | | | 1.31E-03 | | | | | 7.74E-04 | 2.00E-03 | 1.21E-05 | -0.385 | **-0.382** |
| | 72" | | | | | | | | | | 1.29E-03 | | | | | 7.61E-04 | | | | |
| China, South-East | 36" | | | | | | | | | | | | | | | 7.69E-04 | | | | |
| | 48" | | | | | | | | | | | | | | | 7.53E-04 | | | | |
| | 60" | | | | | | | | | | | | | | | 7.74E-04 | | | | |
| | 72" | | | | | | | | | | | | | | | 7.61E-04 | | | | |
| India | 36" | | | | | | | | | | | | | | | | | | | |
| | 48" | | | | | | | | | | | | | | | | | | | |
| | 60" | | | | | | | | | | | | | | | | | | | |
| | 72" | | | | | | | | | | | | | | | | | | | |
| Japan | 36" | | | | | | | | | | | | | | | 6.74E-04 | | | | |
| | 48" | | | | | | | | | | | | | | | 6.60E-04 | | | | |
| | 60" | | | | | | | | | | | | | | | 6.77E-04 | | | | |
| | 72" | | | | | | | | | | | | | | | 6.66E-04 | | | | |
| Malaysia | 36" | | | | | | | | | | | | | | | 1.03E-03 | | | | |
| | 48" | | | | | | | | | | | | | | | 1.01E-03 | | | | |
| | 60" | | | | | | | | | | | | | | | 1.04E-03 | | | | |
| | 72" | | | | | | | | | | | | | | | 1.01E-03 | | | | |
| Middle East | 36" | | | | | | | | | | | | | | | 1.01E-03 | 1.82E-03 | 1.04E-05 | -0.208 | **-0.205** |
| | 48" | | | | | | | | | | | | | | | 9.86E-04 | 1.91E-03 | 1.03E-05 | -0.208 | **-0.205** |
| | 60" | | | | | | | | | | | | | | | 1.01E-03 | 2.00E-03 | 1.21E-05 | -0.208 | **-0.205** |
| | 72" | | | | | | | | | | | | | | | 9.94E-04 | | | | |
| Turkey | 36" | | | | | | | | | | | | | | | 8.56E-04 | | | | |
| | 48" | | | | | | | | | | | | | | | 8.37E-04 | | | | |
| | 60" | | | | | | | | | | | | | | | 8.58E-04 | | | | |
| | 72" | | | | | | | | | | | | | | | 8.43E-04 | | | | |
| South America | | | | | | | | | | | | | | | | | | | | |
| Argentina | 36" | | | | | | | | | | | | | | | 7.23E-04 | | | | |
| | 48" | 9.58E-04 | | | | | | | | | | | | | | 7.10E-04 | | | | |
| | 60" | 9.77E-04 | | | | | | | | | | | | | | 7.27E-04 | | | | |
| | 72" | | | | | | | | | | | | | | | 7.15E-04 | | | | |
| Brazil | 36" | | | | | | | | | | | | | | | 6.82E-04 | | | | |
| | 48" | 9.05E-04 | | | | | | | | | | | | | | 6.70E-04 | | | | |
| | 60" | 9.23E-04 | 3.22E-03 | 1.54E-05 | -0.129 | **-0.125** | | | | | | | | | | 6.87E-04 | | | | |
| | 72" | | | | | | | | | | | | | | | 6.74E-04 | | | | |
| Venezuela | 36" | | | | | | | | | | | | | | | 4.26E-04 | | | | |
| | 48" | | | | | | | | | | | | | | | 4.19E-04 | | | | |
| | 60" | | | | | | | | | | | | | | | 4.29E-04 | | | | |
| | 72" | | | | | | | | | | | | | | | 4.22E-04 | | | | |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

## 9.5 Photochemical oxidation potential: Asia and South America (cont.)

| Photochemical Oxidation ($kg\ C_2H_4$-eq/$m^2$) | | CDA & OSW | TrueVue 5 | | | | TrueVue 15 | | | | TrueVue 30 | | | | TrueVue 40 | | | | Sentinel Silver 20 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Transportation to Customer | Manufacturing | End-of-Life | Operational Energy | **Net $C_2H_4$-eq** | Manufacturing | End-of-Life | Operational Energy | **Net $C_2H_4$-eq** | Manufacturing | End-of-Life | Operational Energy | **Net $C_2H_4$-eq** | Manufacturing | End-of-Life | Operational Energy | **Net $C_2H_4$-eq** | Manufacturing | End-of-Life | Operational Energy | **Net $C_2H_4$-eq** |
| Asia and Pacific | | | | | | | | | | | | | | | | | | | | | | |
| Australia | 36" | 9.86E-04 | | | | | | | | | | | | | | | | | 1.90E-03 | 1.04E-05 | -0.164 | **-0.161** |
| | 48" | 9.65E-04 | | | | | | | | | | | | | | | | | 1.87E-03 | 1.03E-05 | -0.164 | **-0.161** |
| | 60" | 9.88E-04 | | | | | | | | | | | | | | | | | 1.90E-03 | 1.03E-05 | -0.164 | **-0.161** |
| | 72" | 9.74E-04 | | | | | | | | | | | | | | | | | 1.89E-03 | 1.02E-05 | -0.164 | **-0.161** |
| China, Mid-East Coast | 36" | 7.69E-04 | | | | | | | | | | | | | | | | | 1.90E-03 | 1.04E-05 | -0.341 | **-0.338** |
| | 48" | 7.53E-04 | | | | | | | | | | | | | | | | | 1.87E-03 | 1.03E-05 | -0.341 | **-0.338** |
| | 60" | 7.74E-04 | | | | | | | | | | | | | | | | | 1.90E-03 | 1.03E-05 | -0.341 | **-0.338** |
| | 72" | 7.61E-04 | | | | | | | | | | | | | | | | | 1.89E-03 | 1.02E-05 | -0.341 | **-0.338** |
| North-East Asia | 36" | 7.69E-04 | 1.99E-03 | 1.04E-05 | -0.566 | **-0.564** | 1.98E-03 | 1.04E-05 | -0.549 | **-0.547** | 1.92E-03 | 1.04E-05 | -0.406 | **-0.403** | 1.90E-03 | 1.04E-05 | -0.329 | **-0.326** | | | | |
| | 48" | 7.53E-04 | 2.00E-03 | 1.03E-05 | -0.566 | **-0.564** | 2.00E-03 | 1.03E-05 | -0.549 | **-0.547** | 1.91E-03 | 1.03E-05 | -0.406 | **-0.403** | 1.89E-03 | 1.03E-05 | -0.329 | **-0.326** | | | | |
| | 60" | 7.74E-04 | 2.00E-03 | 1.03E-05 | -0.566 | **-0.564** | 2.00E-03 | 1.03E-05 | -0.549 | **-0.547** | 1.93E-03 | 1.03E-05 | -0.406 | **-0.403** | 1.92E-03 | 1.03E-05 | -0.329 | **-0.326** | | | | |
| | 72" | 7.61E-04 | 1.97E-03 | 1.02E-05 | -0.566 | **-0.564** | 1.97E-03 | 1.02E-05 | -0.549 | **-0.547** | 1.91E-03 | 1.02E-05 | -0.406 | **-0.403** | 1.90E-03 | 1.02E-05 | -0.329 | **-0.326** | | | | |
| China, South-East | 36" | 7.69E-04 | | | | | | | | | | | | | | | | | 1.90E-03 | 1.04E-05 | -0.478 | **-0.476** |
| | 48" | 7.53E-04 | | | | | | | | | | | | | | | | | 1.87E-03 | 1.03E-05 | -0.478 | **-0.476** |
| | 60" | 7.74E-04 | | | | | | | | | | | | | | | | | 1.90E-03 | 1.03E-05 | -0.478 | **-0.476** |
| | 72" | 7.61E-04 | | | | | | | | | | | | | | | | | 1.89E-03 | 1.02E-05 | -0.478 | **-0.476** |
| India | 36" | | | | | | | | | | | | | | | | | | | | | |
| | 48" | | | | | | | | | | | | | | | | | | | | | |
| | 60" | | | | | | | | | | | | | | | | | | | | | |
| | 72" | | | | | | | | | | | | | | | | | | | | | |
| Japan | 36" | 6.74E-04 | | | | | | | | | | | | | | | | | 1.90E-03 | 1.04E-05 | -0.080 | **-0.077** |
| | 48" | 6.60E-04 | | | | | | | | | | | | | | | | | 1.87E-03 | 1.03E-05 | -0.080 | **-0.077** |
| | 60" | 6.77E-04 | | | | | | | | | | | | | | | | | 1.90E-03 | 1.03E-05 | -0.080 | **-0.077** |
| | 72" | 6.66E-04 | | | | | | | | | | | | | | | | | 1.89E-03 | 1.02E-05 | -0.080 | **-0.077** |
| Malaysia | 36" | 1.03E-03 | | | | | | | | | | | | | | | | | 1.90E-03 | 1.04E-05 | -0.257 | **-0.254** |
| | 48" | 1.01E-03 | | | | | | | | | | | | | | | | | 1.87E-03 | 1.03E-05 | -0.257 | **-0.254** |
| | 60" | 1.04E-03 | | | | | | | | | | | | | | | | | 1.90E-03 | 1.03E-05 | -0.257 | **-0.254** |
| | 72" | 1.01E-03 | | | | | | | | | | | | | | | | | 1.92E-03 | 1.01E-05 | -0.257 | **-0.254** |
| Middle East | 36" | 1.01E-03 | 1.99E-03 | 1.04E-05 | -0.330 | **-0.327** | 1.98E-03 | 1.04E-05 | -0.319 | **-0.316** | 1.92E-03 | 1.04E-05 | -0.227 | **-0.224** | 1.90E-03 | 1.04E-05 | -0.177 | **-0.174** | 1.90E-03 | 1.04E-05 | -0.177 | **-0.174** |
| | 48" | 9.86E-04 | 2.00E-03 | 1.03E-05 | -0.330 | **-0.327** | 2.00E-03 | 1.03E-05 | -0.319 | **-0.316** | 1.91E-03 | 1.03E-05 | -0.227 | **-0.224** | 1.89E-03 | 1.03E-05 | -0.177 | **-0.175** | 1.87E-03 | 1.03E-05 | -0.177 | **-0.174** |
| | 60" | 1.01E-03 | 2.00E-03 | 1.03E-05 | -0.330 | **-0.327** | 2.00E-03 | 1.03E-05 | -0.319 | **-0.316** | 1.93E-03 | 1.03E-05 | -0.227 | **-0.224** | 1.92E-03 | 1.03E-05 | -0.177 | **-0.174** | 1.90E-03 | 1.03E-05 | -0.177 | **-0.174** |
| | 72" | 9.94E-04 | 1.97E-03 | 1.02E-05 | -0.330 | **-0.327** | 1.97E-03 | 1.02E-05 | -0.319 | **-0.316** | 1.91E-03 | 1.02E-05 | -0.227 | **-0.224** | 1.90E-03 | 1.02E-05 | -0.177 | **-0.175** | 1.89E-03 | 1.02E-05 | -0.177 | **-0.174** |
| Turkey | 36" | 8.56E-04 | | | | | | | | | | | | | | | | | 1.90E-03 | 1.04E-05 | -0.113 | **-0.110** |
| | 48" | 8.37E-04 | | | | | | | | | | | | | | | | | 1.87E-03 | 1.03E-05 | -0.113 | **-0.110** |
| | 60" | 8.58E-04 | | | | | | | | | | | | | | | | | 1.90E-03 | 1.03E-05 | -0.113 | **-0.110** |
| | 72" | 8.43E-04 | | | | | | | | | | | | | | | | | 1.89E-03 | 1.02E-05 | -0.113 | **-0.110** |
| South America | | | | | | | | | | | | | | | | | | | | | | |
| Argentina | 36" | 7.23E-04 | | | | | | | | | | | | | | | | | 1.90E-03 | 1.04E-05 | -0.057 | **-0.055** |
| | 48" | 7.10E-04 | | | | | | | | | | | | | | | | | 1.87E-03 | 1.03E-05 | -0.057 | **-0.055** |
| | 60" | 7.27E-04 | | | | | | | | | | | | | | | | | 1.91E-03 | 1.03E-05 | -0.057 | **-0.055** |
| | 72" | 7.15E-04 | | | | | | | | | | | | | | | | | 1.89E-03 | 1.02E-05 | -0.057 | **-0.055** |
| Brazil | 36" | 6.82E-04 | | | | | | | | | | | | | | | | | 1.90E-03 | 1.04E-05 | -0.104 | **-0.102** |
| | 48" | 6.70E-04 | | | | | | | | | | | | | | | | | 1.87E-03 | 1.03E-05 | -0.104 | **-0.102** |
| | 60" | 6.87E-04 | | | | | | | | | | | | | | | | | 1.90E-03 | 1.03E-05 | -0.104 | **-0.102** |
| | 72" | 6.74E-04 | | | | | | | | | | | | | | | | | 1.89E-03 | 1.02E-05 | -0.104 | **-0.102** |
| Venezuela | 36" | 4.26E-04 | 1.99E-03 | 1.04E-05 | -0.272 | **-0.270** | 1.98E-03 | 1.04E-05 | -0.264 | **-0.262** | | | | | | | | | 1.90E-03 | 1.04E-05 | -0.173 | **-0.171** |
| | 48" | 4.19E-04 | 2.00E-03 | 1.03E-05 | -0.272 | **-0.270** | 2.15E-03 | 1.03E-05 | -0.264 | **-0.262** | | | | | | | | | 1.87E-03 | 1.03E-05 | -0.173 | **-0.171** |
| | 60" | 4.29E-04 | 2.00E-03 | 1.03E-05 | -0.272 | **-0.270** | 2.00E-03 | 1.03E-05 | -0.264 | **-0.262** | | | | | | | | | 1.90E-03 | 1.03E-05 | -0.173 | **-0.171** |
| | 72" | 4.22E-04 | 1.97E-03 | 1.02E-05 | -0.272 | **-0.270** | 1.97E-03 | 1.02E-05 | -0.264 | **-0.262** | | | | | | | | | 1.89E-03 | 1.02E-05 | -0.173 | **-0.171** |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

## 9.5 Photochemical oxidation potential: Asia and South America (cont.)

| Photochemical Oxidation ($kg\ C_2H_4$-eq/$m^2$) | | | CDA & OSW | Sentinel Silver 35 | | | | Sentinel Stainless Steel 15 | | | | Sentinel Stainless Steel 25 | | | | Sentinel Stainless Steel 40 | | | | Sentinel Stainless Steel 45 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Transportation to Customer | Manufacturing | End-of-Life | Operational Energy | **Net $C_2H_4$-eq** | Manufacturing | End-of-Life | Operational Energy | **Net $C_2H_4$-eq** | Manufacturing | End-of-Life | Operational Energy | **Net $C_2H_4$-eq** | Manufacturing | End-of-Life | Operational Energy | **Net $C_2H_4$-eq** | Manufacturing | End-of-Life | Operational Energy | **Net $C_2H_4$-eq** |
| Asia and Pacific | Australia | 36" | 9.86E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 9.65E-04 | 2.19E-03 | 1.03E-05 | -0.136 | **-0.133** | | | | | | | | | | | | | | | | |
| | | 60" | 9.88E-04 | 1.89E-03 | 1.03E-05 | -0.136 | **-0.133** | | | | | 1.90E-03 | 1.03E-05 | -0.131 | **-0.128** | 1.89E-03 | 1.03E-05 | -0.104 | **-0.101** | | | | |
| | | 72" | 9.74E-04 | 1.88E-03 | 1.02E-05 | -0.136 | **-0.133** | | | | | 1.90E-03 | 1.02E-05 | -0.131 | **-0.129** | 1.89E-03 | 1.02E-05 | -0.104 | **-0.101** | | | | |
| | China, Mid-East Coast | 36" | 7.69E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 7.53E-04 | 1.86E-03 | 1.03E-05 | -0.278 | **-0.275** | | | | | | | | | | | | | | | | |
| | | 60" | 7.74E-04 | 1.89E-03 | 1.03E-05 | -0.278 | **-0.275** | 1.93E-03 | 1.03E-05 | -0.311 | **-0.308** | 1.90E-03 | 1.03E-05 | -0.273 | **-0.270** | | | | | | | | |
| | | 72" | 7.61E-04 | 1.88E-03 | 1.02E-05 | -0.278 | **-0.275** | 1.92E-03 | 1.02E-05 | -0.311 | **-0.308** | 1.90E-03 | 1.02E-05 | -0.273 | **-0.270** | | | | | | | | |
| | North-East Asia | 36" | 7.69E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 7.53E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 60" | 7.74E-04 | | | | | 1.93E-03 | 1.03E-05 | -0.317 | **-0.314** | 1.90E-03 | 1.03E-05 | -0.278 | **-0.275** | | | | | | | | |
| | | 72" | 7.61E-04 | | | | | 1.92E-03 | 1.02E-05 | -0.317 | **-0.314** | 1.90E-03 | 1.02E-05 | -0.278 | **-0.275** | | | | | | | | |
| | China, South-East | 36" | 7.69E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 7.53E-04 | 1.86E-03 | 1.03E-05 | -0.375 | **-0.372** | | | | | | | | | | | | | | | | |
| | | 60" | 7.74E-04 | 1.89E-03 | 1.03E-05 | -0.375 | **-0.372** | | | | | | | | | | | | | | | | |
| | | 72" | 7.61E-04 | 1.88E-03 | 1.02E-05 | -0.375 | **-0.372** | | | | | | | | | | | | | | | | |
| | India | 36" | | | | | | | | | | | | | | | | | | | | | |
| | | 48" | | | | | | | | | | | | | | | | | | | | | |
| | | 60" | | | | | | | | | | | | | | | | | | | | | |
| | | 72" | | | | | | | | | | | | | | | | | | | | | |
| | Japan | 36" | 6.74E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 6.60E-04 | 1.86E-03 | 1.03E-05 | -0.065 | **-0.063** | | | | | | | | | | | | | | | | |
| | | 60" | 6.77E-04 | 1.89E-03 | 1.03E-05 | -0.065 | **-0.063** | | | | | | | | | | | | | | | | |
| | | 72" | 6.66E-04 | 1.88E-03 | 1.02E-05 | -0.065 | **-0.063** | | | | | | | | | | | | | | | | |
| | Malaysia | 36" | 1.03E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 1.01E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 60" | 1.04E-03 | | | | | 1.93E-03 | 1.03E-05 | -0.234 | **-0.231** | | | | | | | | | | | | |
| | | 72" | 1.01E-03 | | | | | 1.93E-03 | 1.02E-05 | -0.234 | **-0.231** | | | | | | | | | | | | |
| | Middle East | 36" | 1.01E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 9.86E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 60" | 1.01E-03 | | | | | | | | | | | | | | | | | | | | |
| | | 72" | 9.94E-04 | | | | | | | | | | | | | | | | | | | | |
| | Turkey | 36" | 8.56E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 8.37E-04 | 1.86E-03 | 1.03E-05 | -0.096 | **-0.093** | | | | | | | | | | | | | | | | |
| | | 60" | 8.58E-04 | 1.89E-03 | 1.03E-05 | -0.096 | **-0.093** | | | | | | | | | | | | | | | | |
| | | 72" | 8.43E-04 | 1.88E-03 | 1.02E-05 | -0.096 | **-0.093** | | | | | | | | | | | | | | | | |
| South America | Argentina | 36" | 7.23E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 7.10E-04 | 1.86E-03 | 1.03E-05 | -0.047 | **-0.045** | | | | | | | | | | | | | | | | |
| | | 60" | 7.27E-04 | 1.89E-03 | 1.03E-05 | -0.047 | **-0.045** | 1.93E-03 | 1.03E-05 | -0.053 | **-0.050** | | | | | | | | | 1.89E-03 | 1.03E-05 | -0.031 | **-0.028** |
| | | 72" | 7.15E-04 | 1.88E-03 | 1.02E-05 | -0.047 | **-0.045** | 1.92E-03 | 1.02E-05 | -0.053 | **-0.050** | | | | | | | | | 1.89E-03 | 1.02E-05 | -0.031 | **-0.028** |
| | Brazil | 36" | 6.82E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 6.70E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 60" | 6.87E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 72" | 6.74E-04 | | | | | | | | | | | | | | | | | | | | |
| | Venezuela | 36" | 4.26E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 48" | 4.19E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 60" | 4.29E-04 | | | | | | | | | | | | | | | | | | | | |
| | | 72" | 4.22E-04 | | | | | | | | | | | | | | | | | | | | |

Small numbers are presented in **scientific notation**, e.g. 0.000023 = 2.3E-05 | **Positive number**: emissions produced | **Negative number**: emissions avoided by using window film

# 10. Net environmental impacts by region

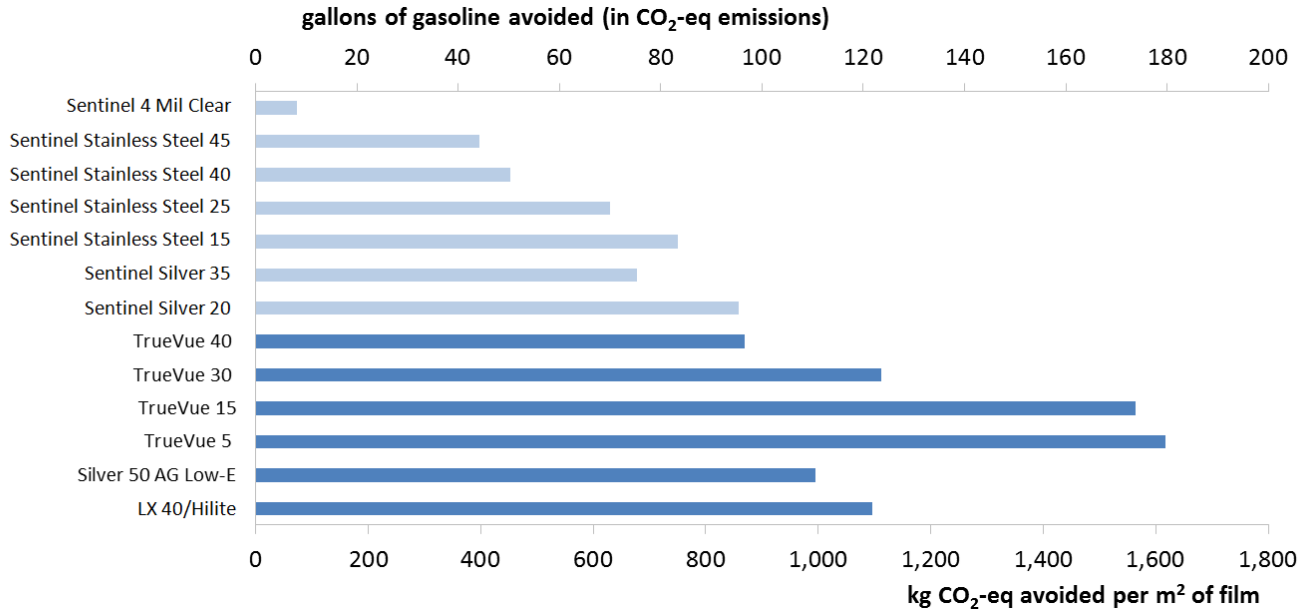
The following charts illustrate the net environmental impact of various Solar Gard window films for each of the 25 customer regions studied. This impact is based on the amount of global warming-related emissions that are *avoided* by installing one square meter of film on a window at the given location, under the use stage assumptions of the LCA, over the lifetime of the film.

Each chart demonstrates the impact in kilograms of $CO_2$-eq avoided per square meter. It also presents this same impact in the form of gallons of gasoline avoided that would produce an equivalent amount of $CO_2$-eq emissions. This scaling is based on the amount of 8.92 kg $CO_2$-eq emitted per gallon of gasoline combusted (*U.S. EPA 2010*).

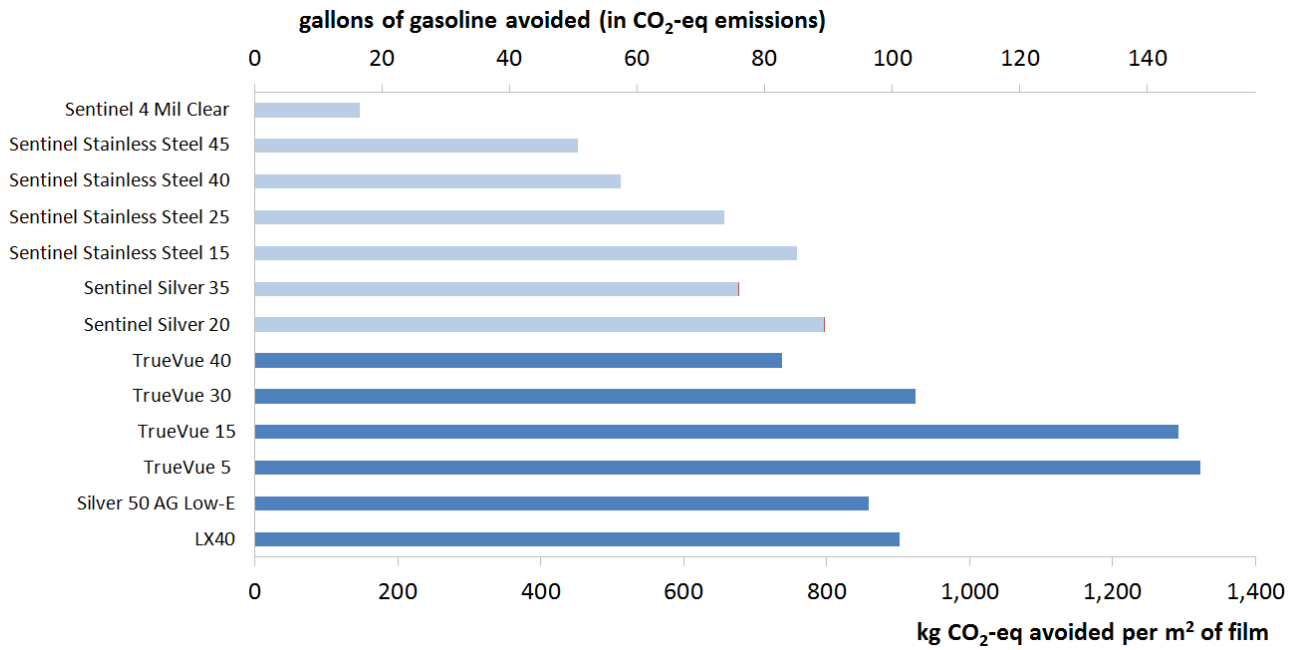
*Color legend:* Outside Weatherable films; Interior films

While these charts are based on data for 60”-wide rolls of film, the results for the other widths (36”, 48”, and 72”) are similar; their exact values can be found in the tables of Section 10.1. The charts include only the films whose performance has been simulated in each region, based on sales records for each film type. The values for LX 40 also represent the Hilite 40 film, which has an equal environmental impact. Regions are listed by continent in the following order: North America, Europe, Asia, and South America. Certain regions (Canada, Russia) demonstrate negative savings, meaning that the installation of window film does not offset the global warming potential embodied in the production of the product. This is due to the fact that very cold climates have little or no air conditioning needs and a heavier heating penalty when using window film. In these regions, window films are mainly used for control against glare and UV rays.

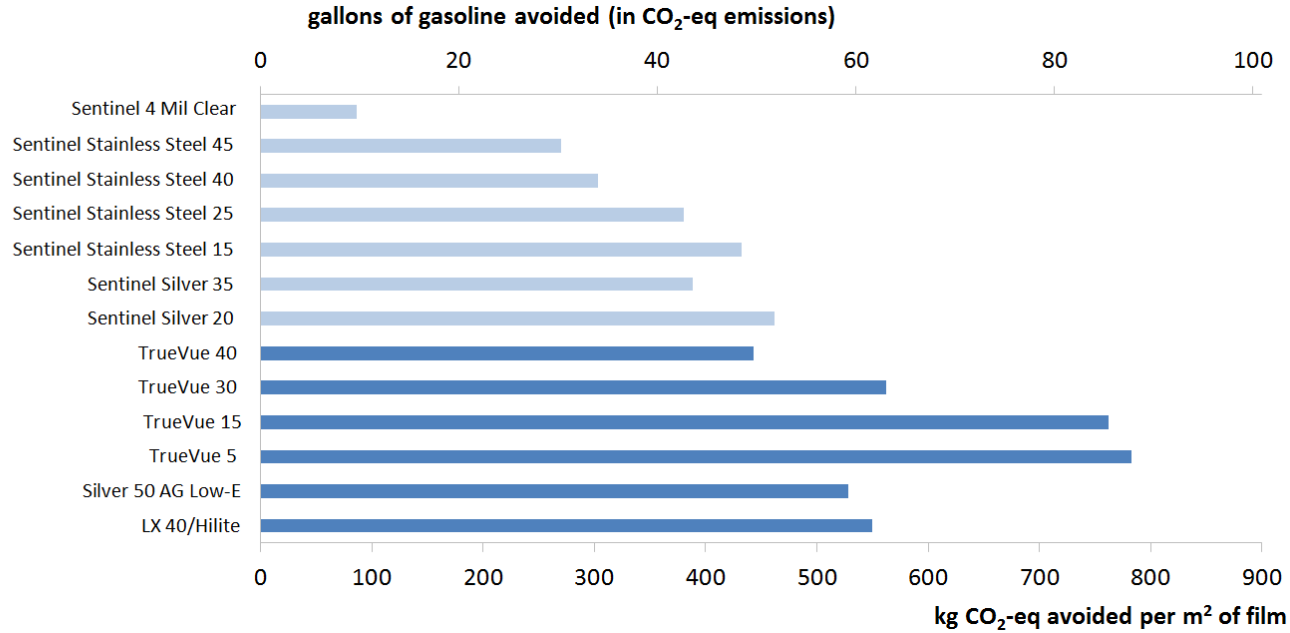
## *USA: ASHRAE Zones 1 and 2*



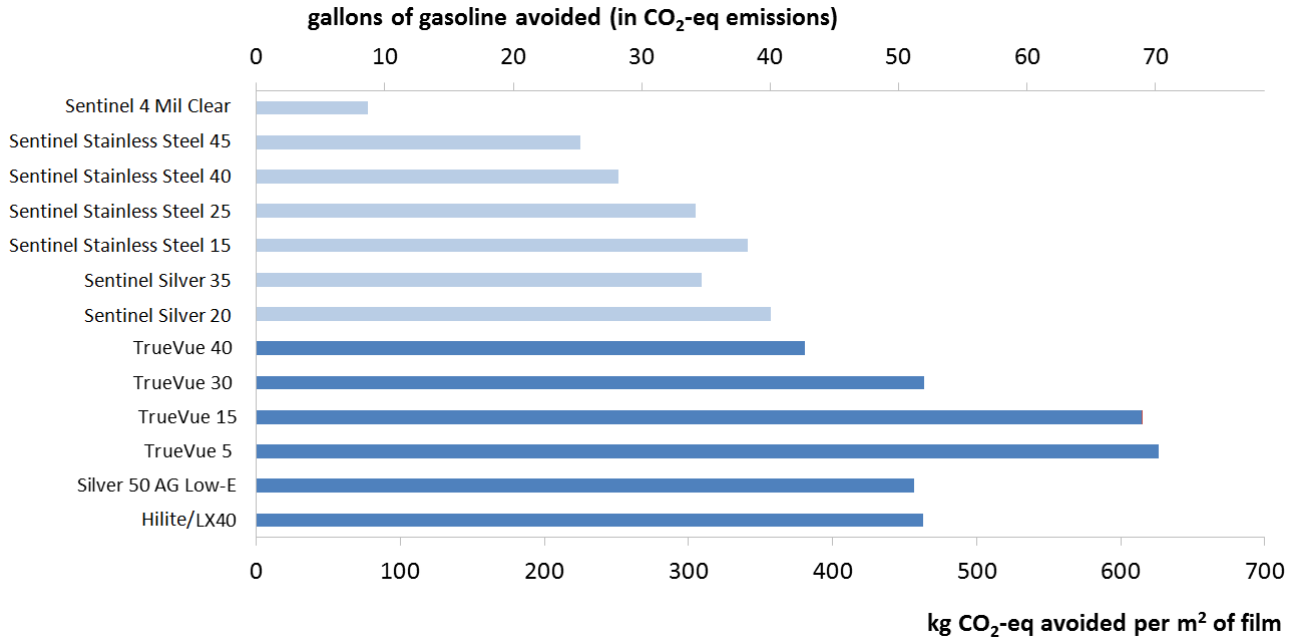
## USA: ASHRAE Zone 3



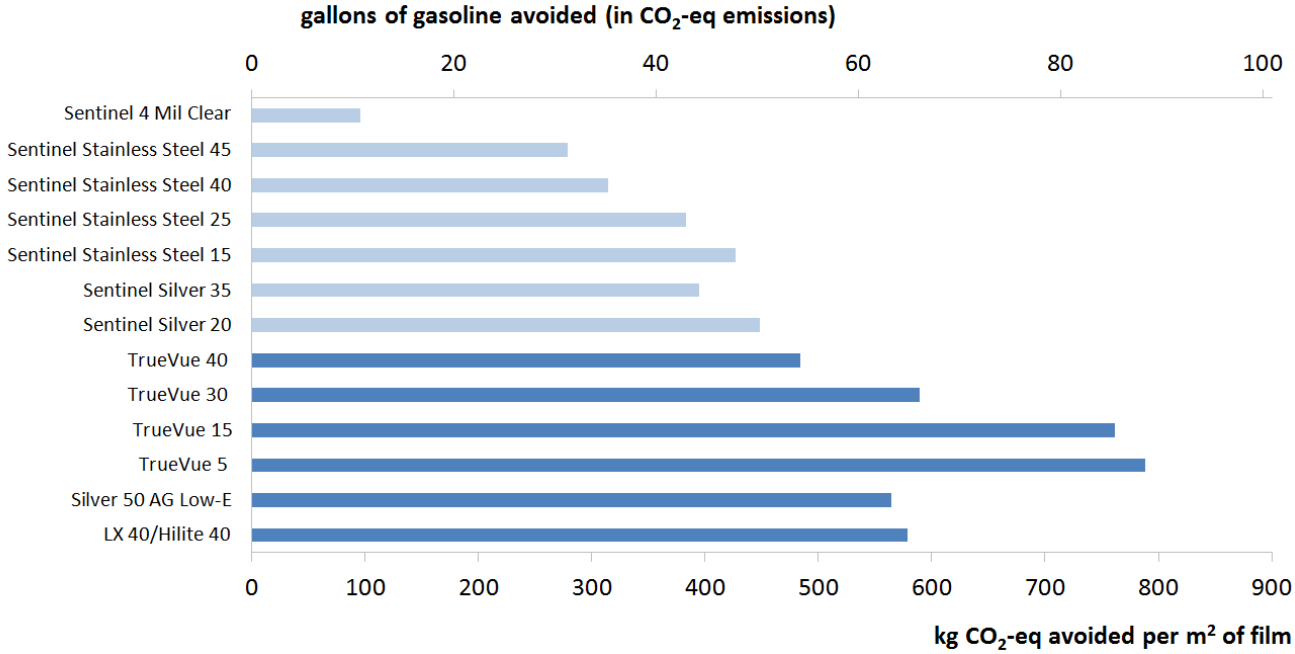

## USA: ASHRAE Zone 4



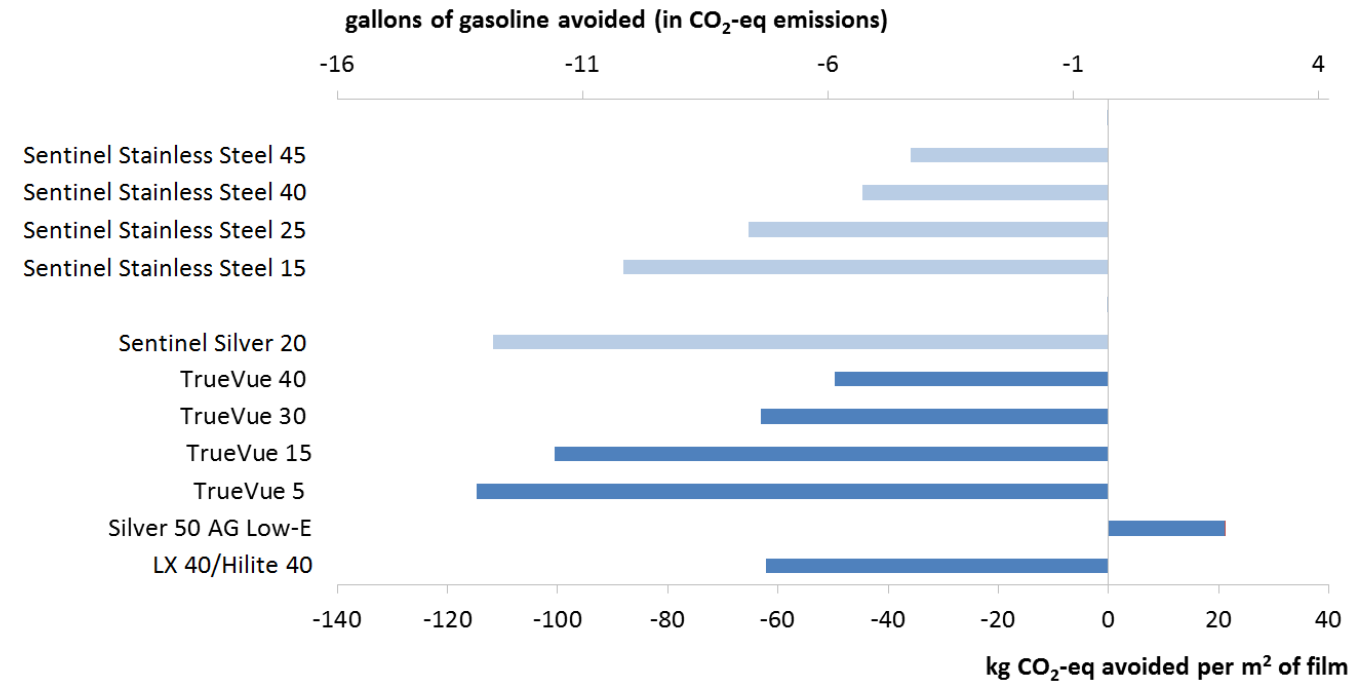
## USA: ASHRAE Zone 5



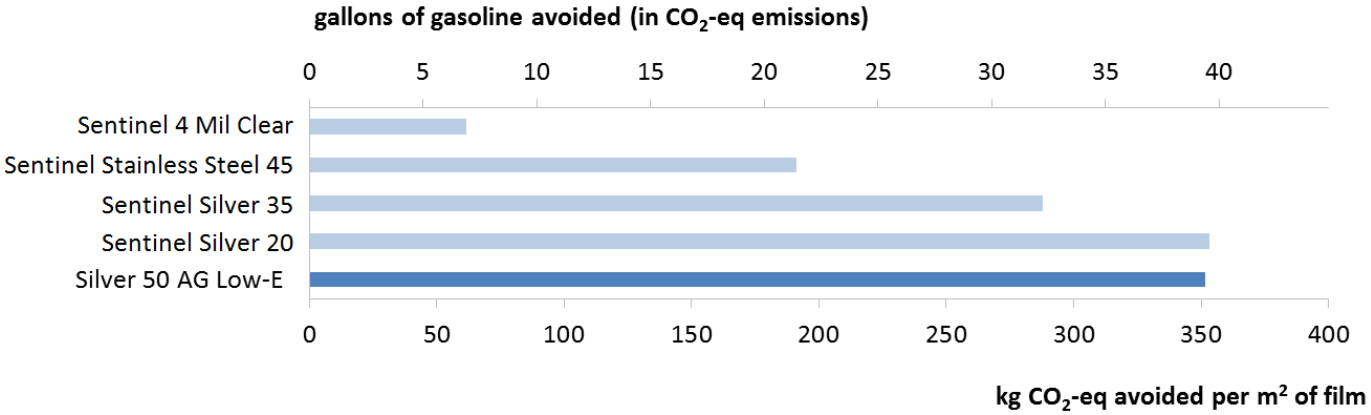

## USA: ASHRAE Zones 6 and 7



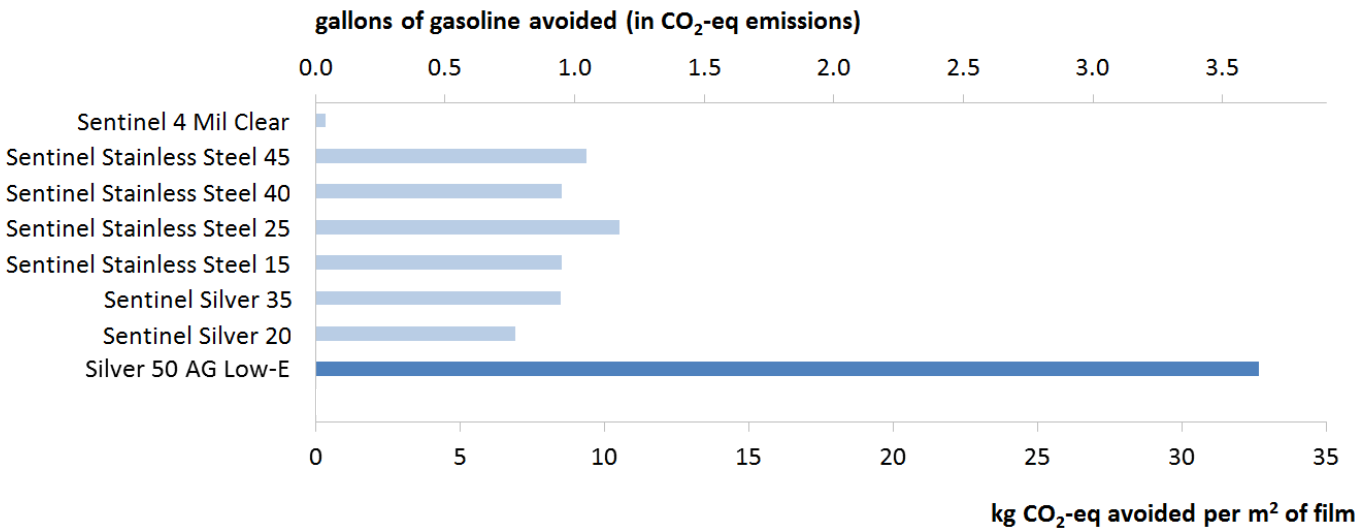
## Canada



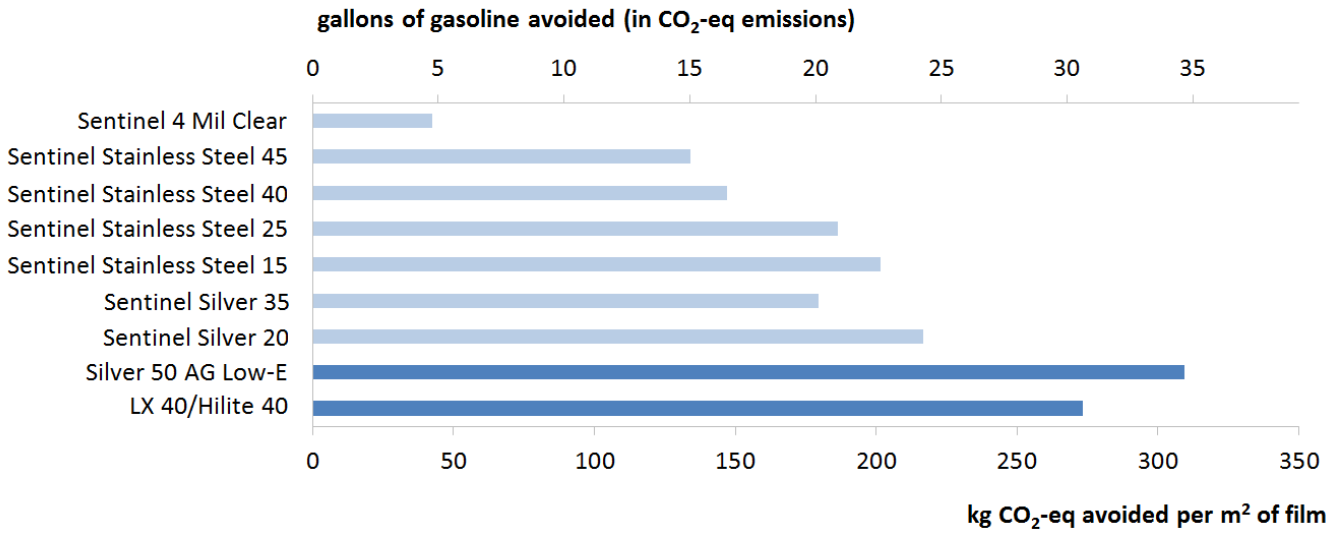

## Mexico



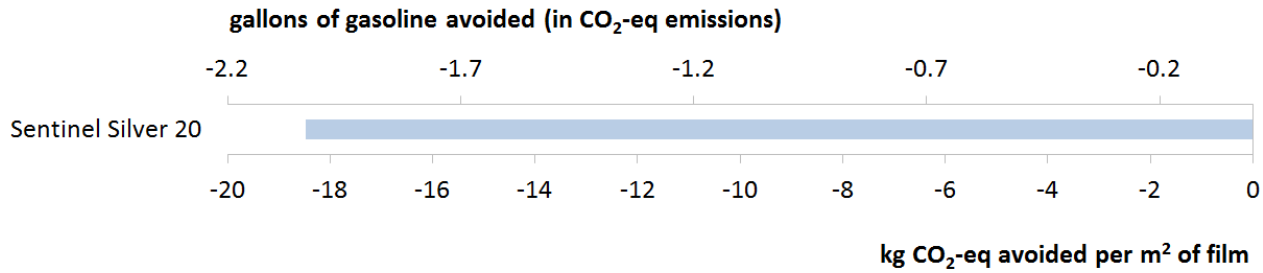
## France



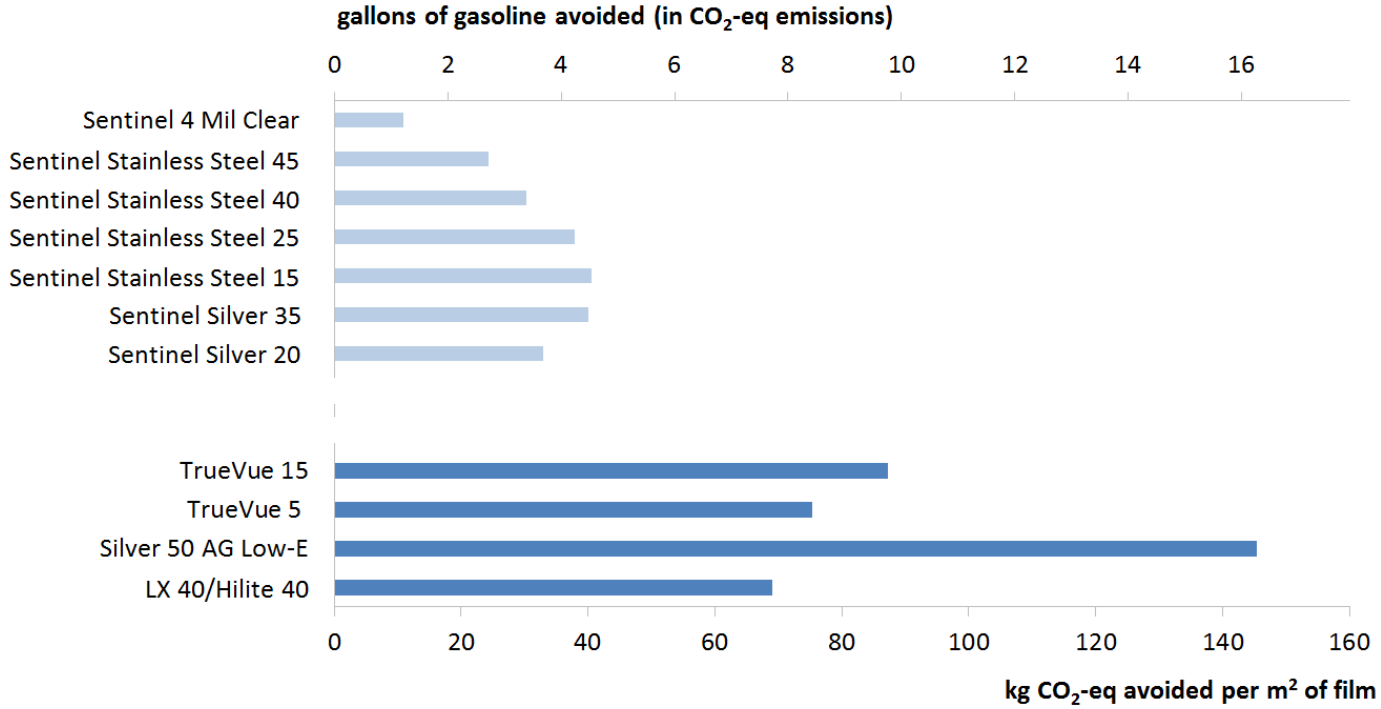

## Northern Europe



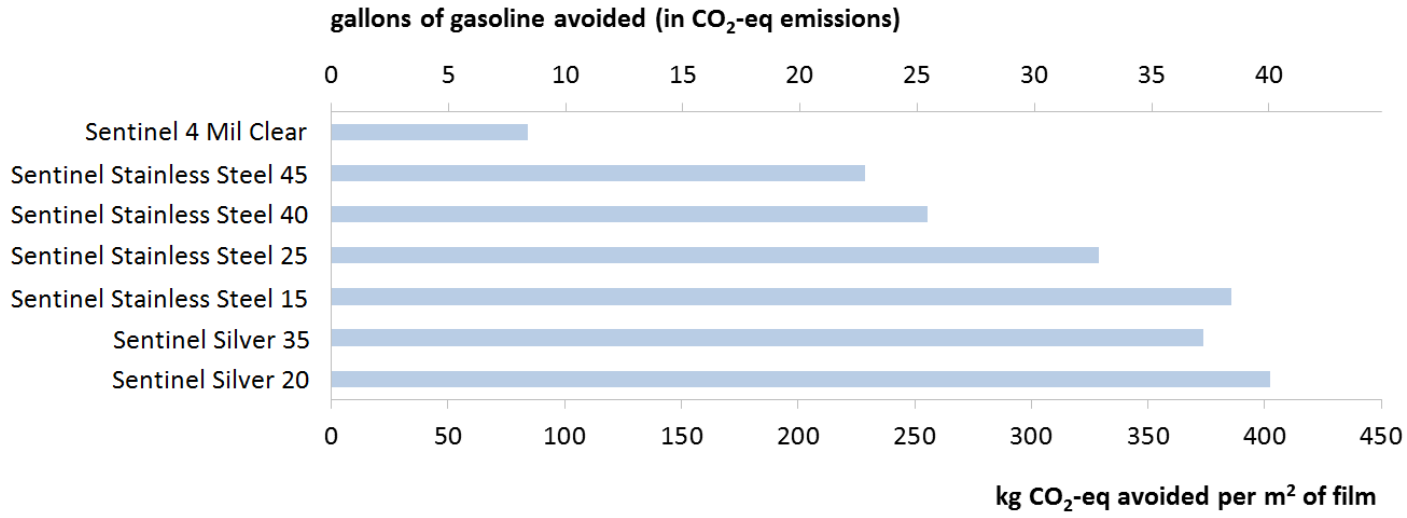
## Russia



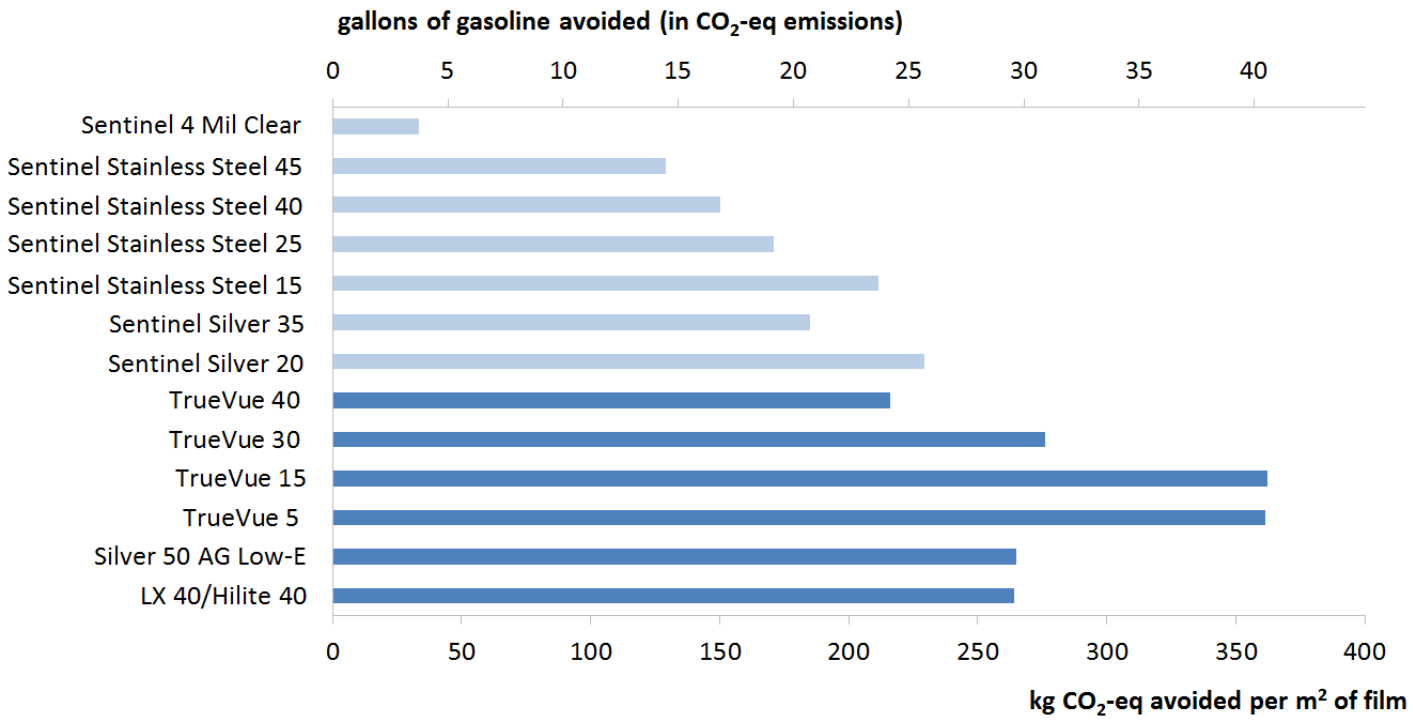

## Scandinavia



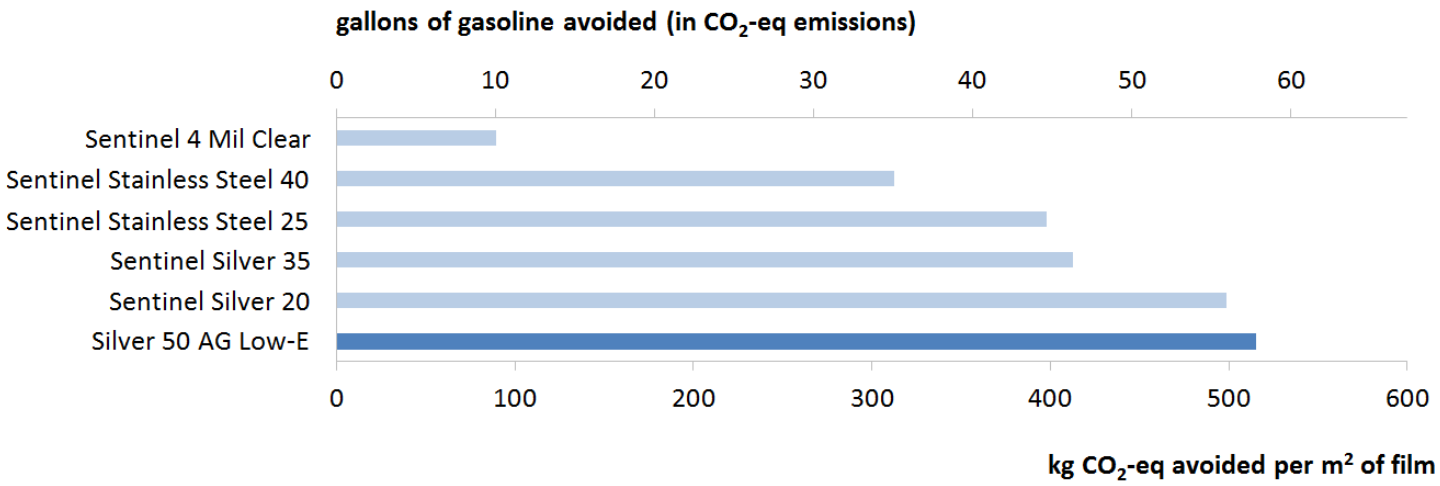
## Southern Europe



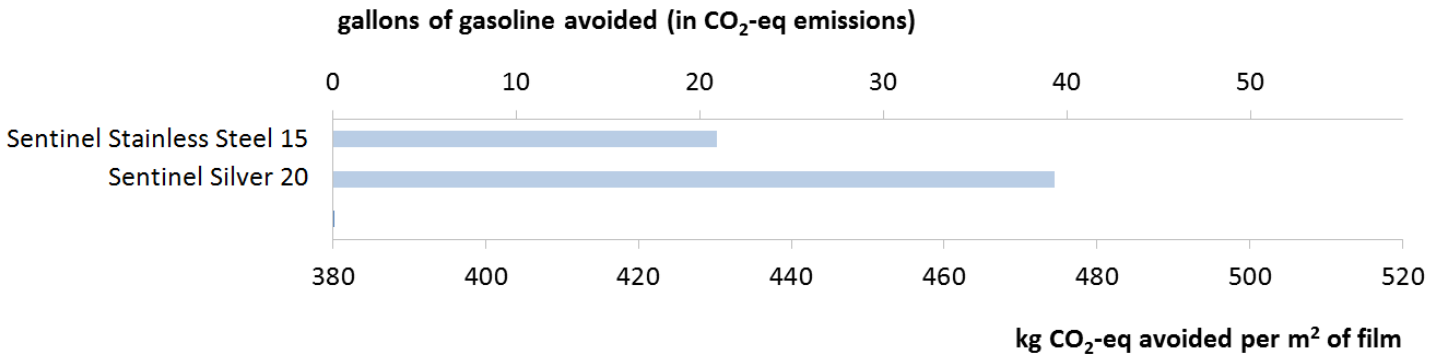

## United Kingdom



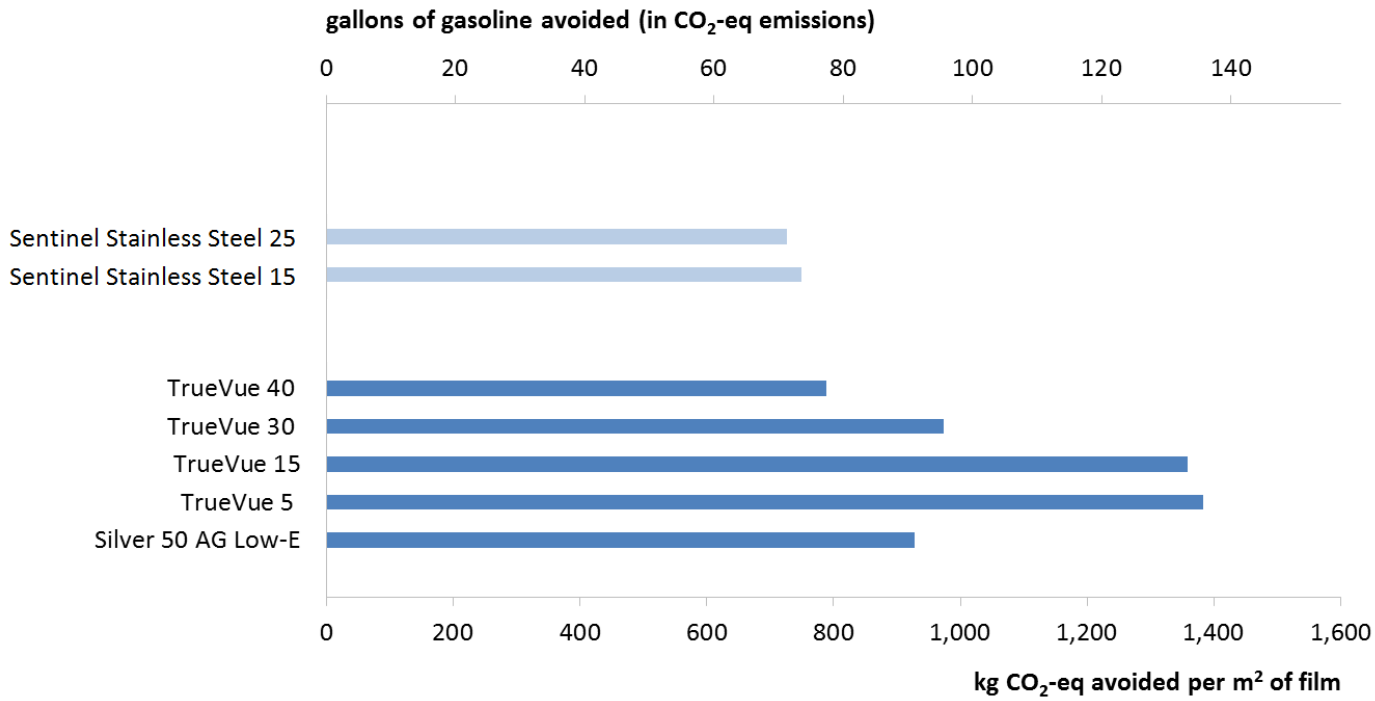
## Australia



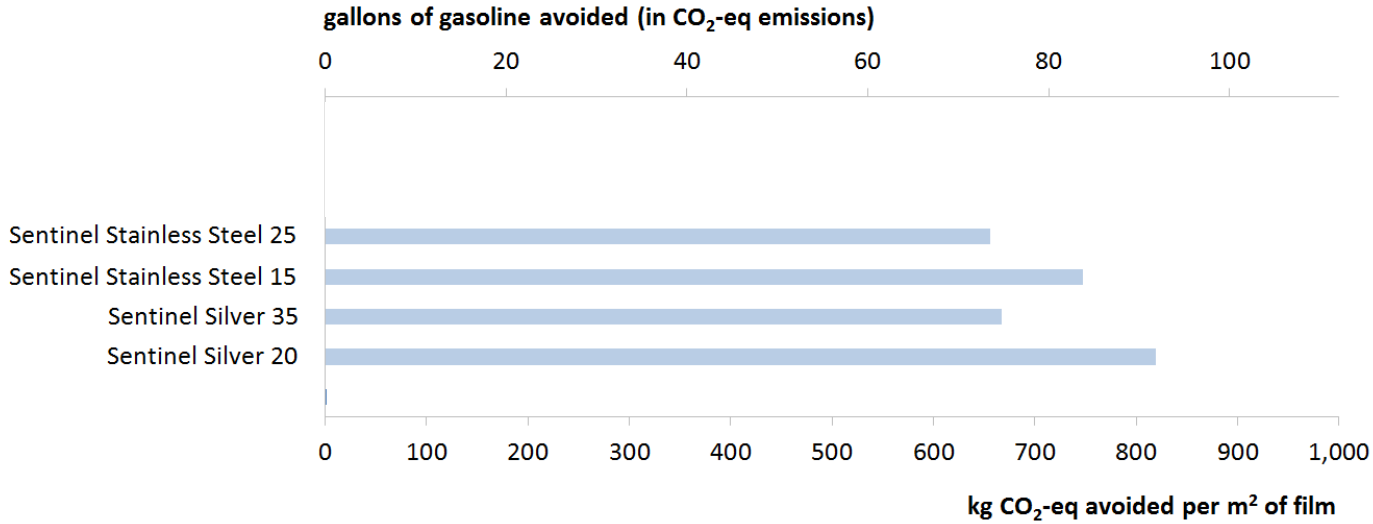

## Malaysia



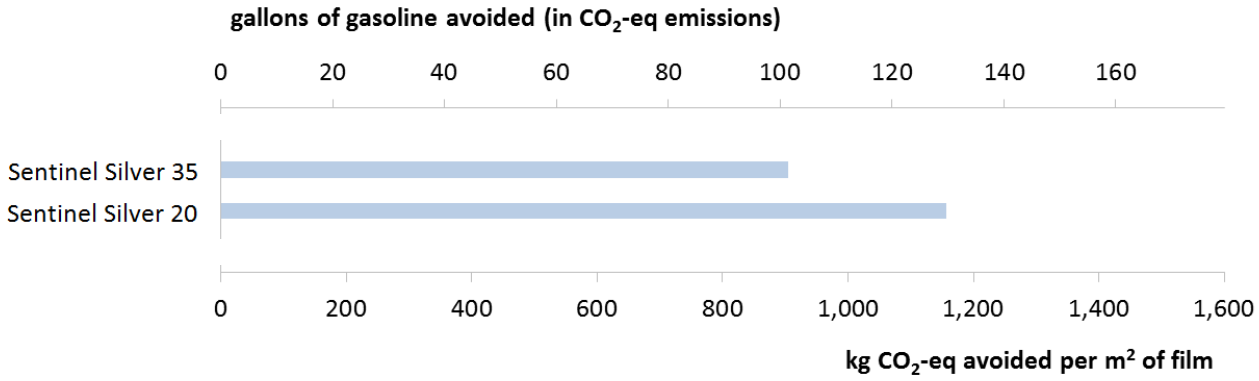
## North-East Asia



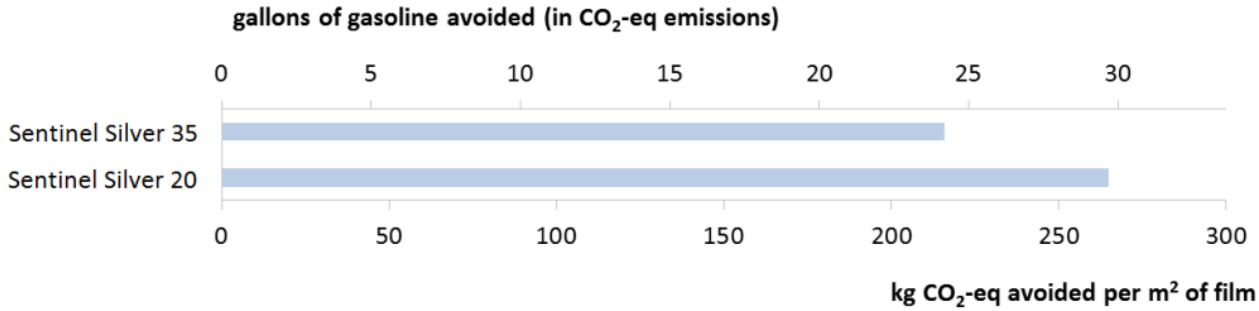

## China, Mid-East Coast



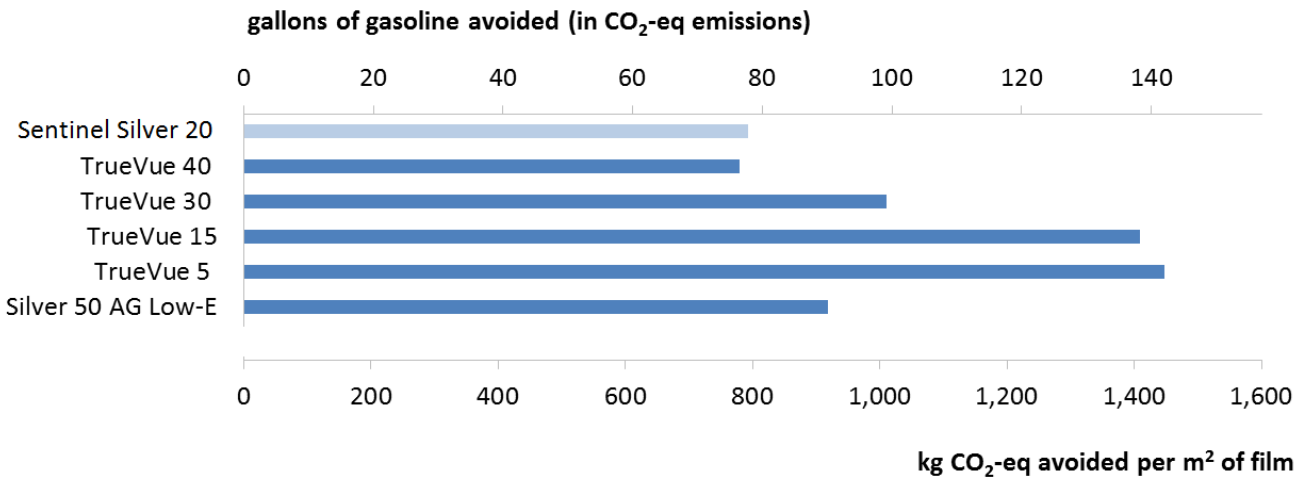
## China, Southeast



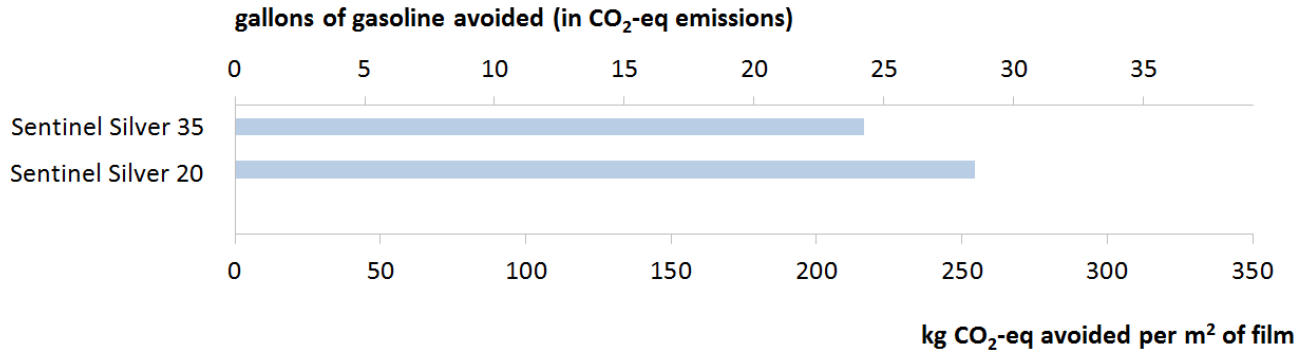

## Japan



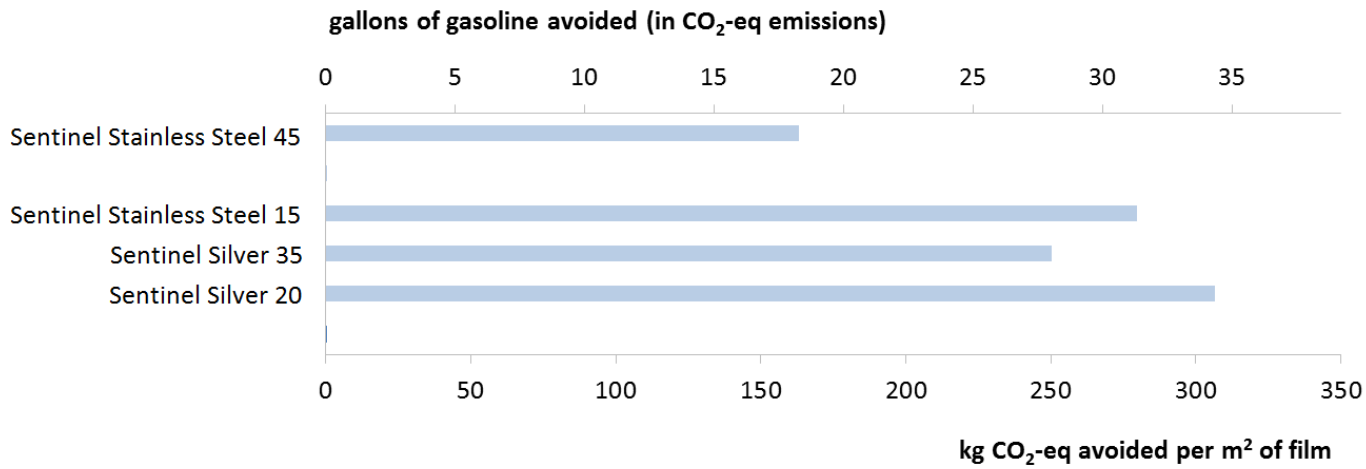
## *Middle East*



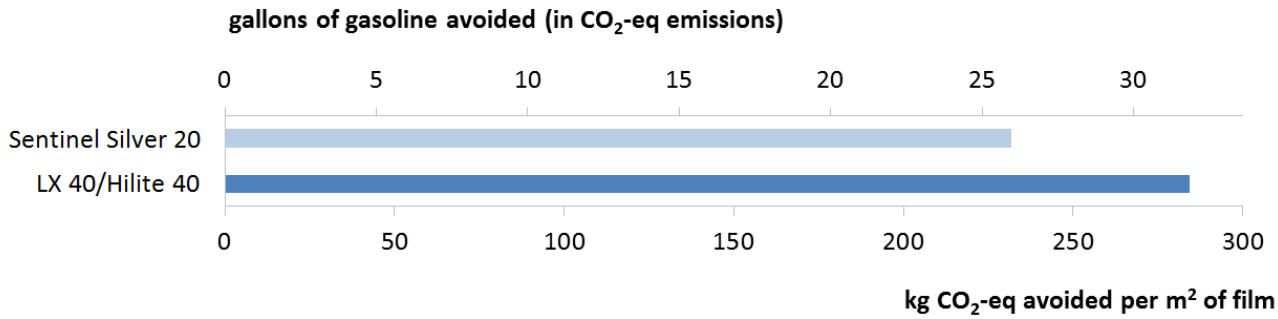

## *Turkey*



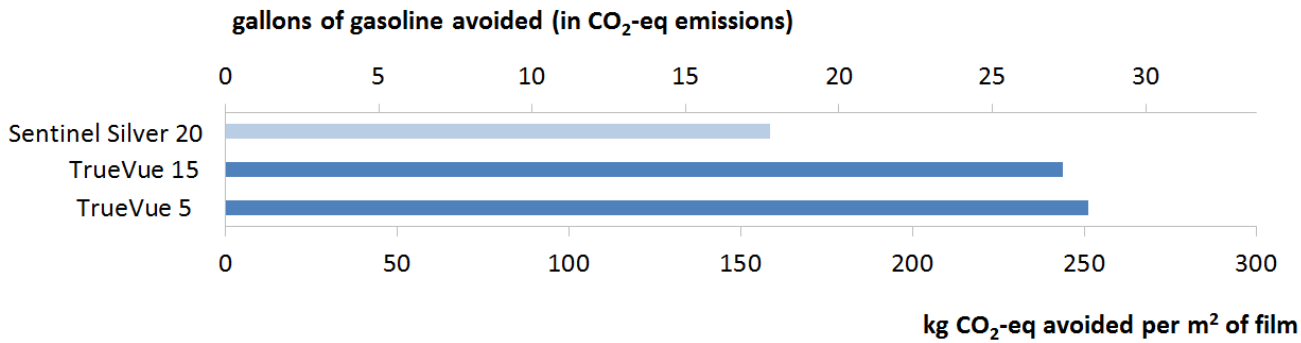
## Argentina




## Brazil




## Venezuela



## 11. Interpretation

**Acidification** ($SO_2$-eq) is offset by the use phase in all of the regions studied, for all film types. The majority of the embodied acidification comes from the burning of fossil fuels. Because of this, transportation and electricity generation contribute largely to the embodied acidification. Therefore, for regions in which a large portion of the electricity is generated from fossil fuels will offset more $SO_2e$ and at a faster rate than countries with little or no fossil fuel electricity generation. The net $SO_2e$ savings varies between 14.25 kg/$m_2$ and 0.05 kg/$m_2$, a difference of 14.2 kg/$m_2$.

**Eutrophication** ($PO_4$-eq) is offset by the use phase in all of the regions studied, for all film types except Sentinel 4 Mil Clear OSW when used in Canada. The embodied eutrophication is largely from aircraft transportation and electricity generation. Regions with large amounts of fossil fuel used for electricity generation and regions close to the manufacturing plant in San Diego will offset more $PO_4e$ and at a faster rate than countries with little or no fossil fuel electricity generation and that require air transportation to receive the product. The range of net $PO_4e$ varies between negative 3.157 kg/$m_2$ and positive 0.001 kg/$m_2$, a difference of 3.158 kg/$m_2$.

**Global Warming Potential** ($CO_2$-eq) is offset by all of the film types in many of the regions studied. Canada and Russia are the two regions where the application of Solar Gard architectural solar control window film may not offset the embodied global warming potential. This is because these two countries have very cool climates with little or no air conditioning needs and a heavier heating penalty when using window film, as well as due to the fact that Canada uses very few fossil fuels in its electricity generation. In all other regions, the amount of embodied CO2e in SGSG's architectural solar-control window films from manufacture and transportation is low compared to the avoided emissions related to the use of the films. The amount of CO2e varies between negative 1,603 kg/m2 and positive 114 kg/m2, a difference of 1,717 kg/m2.

**Ozone Layer Depletion** (CFC-11-eq) is offset by the films in only some of the regions studied. The regions in which the embodied ozone layer depletion is offset are all hot climates which require a lot of air conditioning and do not have a heating penalty. These regions include ASHRAE Climate Zone 1&2, Mexico, Southern Europe, South-East China, Turkey, the Middle East, Malaysia, Argentina, Brazil and Venezuela. Most of the embodied ozone layer depletion is obtained from the electricity generation, so countries that use large amounts of fossil fuels to generate electricity will have better changes to offset the embodied ozone layer depletion. The net CFC-11e varies between negative 0.0000869 kg/$m_2$ and positive 0.0000671 kg/$m_2$, a difference of 0.000154 kg/$m_2$.

**Photochemical Oxidation** ($C_2H_4$-eq) is offset by all of the films in most of the regions studied. Canada, Scandinavia and Russia are the regions where the embodied photochemical oxidation for many of the films is not offset by the use of a window film. This is due to the bcombination of the low fossil fuel electricity and the heating penalty incurred in a cold climate. The $C_2H_4e$ varies between negative 0.692 kg/$m^2$ and positive 0.031 kg/$m^2$, a difference of 0.723 kg/$m^2$.

## 12. Glossary

**Acidification Potential (kg $SO_2$-eq)**
The phenomenon in which atmospheric precipitations have a lower pH value than normal, which can cause damage to forests, crops, and aquatic ecosystems. It is the result of emissions of $SO_2$, NOx and $NH_3$ into the atmosphere, and is expressed in kilograms of $SO_2$-equivalents.

**Eutrophication Potential (kg $PO_4$-eq)**
The enrichment of watercourses with nutrients, which causes imbalances in aquatic ecosystems due to overdevelopment. It includes phosphorous and nitrogen salts and is expressed in kilograms of $PO_4$-equivalents.

**Global Warming Potential (kg $CO_2$-eq)**
A measure of how much heat greenhouse gases trap in the atmosphere. It stems from emissions of $CO_2$ and other gases contributing to infrared ray absorption (such as $CH_4$, $N_2O$, and CFCs) and is expressed in kilograms of $CO_2$-equivalents.

**Ozone Layer Depletion Potential (kg CFC 11-eq)**
The depletion of the stratospheric ozone layer by means of compounds contained in chlorofluorocarbons (CFCs) and chlorofluoromethanes (CFMs). It is based on the ozone depletion potential of trichlorofluoromethane and expressed in kilograms of CFC-11-equivalents.

**Photochemical Oxidation Potential (kg $C_2H_4$-eq)**
The production of compounds which, with the action of light, can promote an oxidation reaction that leads to the creation of ozone in the troposphere. It results from Volatile Organic Compounds (VOCs) and is expressed in kilograms of $C_2H_4$-equivalents.

## 13. References


Product Category Rules and PCR Basic Module, CPC Division (n/a): Construction Products and CPC Division 54: Construction Services, Version 1.0, 2012-01-09

General Programme Instructions for Environmental Product Declarations, EPD, Version 1.0, 2008-02-29

ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and procedures

ISO 14040:2006 Environmental management – Life cycle assessment – Principles and framework

ISO 14044:2006 Environmental management – Life cycle assessment – Requirements and guidelines

ISO 21930:2007 – Sustainability in building construction – Environmental declaration of building products

ASHRAE Standards 90.1 2004 & 90.2 2004

SimaPro v7.3.2 Software

Ecoinvent v2.2 Database for Life Cycle Engineering

Google Maps & Google Earth

U.S. Energy Information Administration, *http://www.eia.gov*
U.S. Environmental Protection Agency, *http://www.epa.gov*

Material Safety and Data Sheets (MSDS)

Data provided by Solar Gard Saint-Gobain LLC, including:

Sales Data, Utility Bills, Bills of Materials, Climate Registry Information System (CRIS) Reports