

# PPG Performance Glazing Data Submissions for ASTM E 2129-05 February 2009



PPG Performance Glazings is committed to using materials, manufacturing products and pursuing business practices that help sustain a healthy global environment. This document contains data submissions for the following PPG architectural (float) glass products as they apply to the ASTM E 2129-05 *Standard Practice for Data Collection for Sustainability Assessment of Building Products*:

## Manufactured products

Float glass: clear, low-iron, tinted, reflective, with solar control and passive low-e coatings.

## Product brand/trade names:

### *Solarban*® Solar Control Low-E Glasses

- *Solarban z50* glass
- *Solarban 60* glass
- *Solarban 70XL* glass
- *Solarban 80* glass

### *Oceans of Color*® Spectrally Selective Tinted Glasses

- *Atlantica*® glass
- *Azuria*® glass
- *Caribia*® glass
- *Solexia*® glass

### *Sungate*® Passive Low-E Glasses

- *Sungate 100* glass
- *Sungate 500* glass

*Solarcool*® reflective glasses

*Vistacool*® reflective glasses

*PPG believes the information presented is currently accurate; however, no guarantee of accuracy, comprehensiveness, or performance is given or implied.*

## ASTM E 2129-05

Table 1: General Questions

### DIVISION 1 – GENERAL REQUIREMENTS

QUESTION	YES or NO	N/A	U/K	COMMENTS
<b>Criterion No. 1–Materials (Product Feedstock)</b>				
<p><b>1.1</b> Have efforts (such as mining management, site restoration, and so forth) been made to minimize or avoid negative environmental impacts, or both, (such as impact to rare or endangered resources or species, releases of toxic chemicals or hazardous air pollutants, and so forth) in obtaining raw materials for this product? If yes, describe these efforts.</p>	<b>Yes</b>			<p>The greatest constituent in glass is sand (&gt;70%). PPG utilizes several sand suppliers that have transparent and committed efforts to maintain the integrity of the land during and after their extraction activities, which include: utilizing resources responsibly, conserving water and energy, and engaging in reclamation and revegetation of mine sites to create wildlife sanctuaries, fish habitats, wetlands and prairies. Several of our supplier mine site facilities operate without impact in fragile wetlands, coexist in the nesting grounds of protected bird species, and operate unobtrusively beside recreational swimming and sailing facilities. They also are actively involved in a variety of conservation and beautification projects with local and national groups, the Audubon Society and the Wildlife Habitat Council.</p>
<p><b>1.2</b> Is the product a recycled content product? If YES, indicate what percentage of the product is recycled and differentiate between pre-consumer and post-consumer recycled content.</p>	<b>No</b>			<p>PPG glass contains up to 20% (by weight) reutilized material in the form of cullet, the scrap glass that is generated during the manufacture of glass. In addition to ASTM E 2129-05, other standards citing definitions for recycled content include ISO 14021 and FTC, Part 260 -- <i>Guides for the Use of Environmental Marketing Claims</i>. These guides state that scrap materials, such as cullet, reutilized in the manufacturing process are not considered recycled content. However, knowing the chemical composition of the cullet, PPG is able to stockpile the material for reutilization as a feedstock, thereby minimizing the use of virgin materials and energy.</p>
<p><b>1.3</b> If applicable, does the recycled content product contain the percentage of recovered materials recommended by the U.S. EPA's Comprehensive Procurement Guidelines (CPG)?</p>	<b>No</b>			<p>ASTM Methodology E2129-05 utilizes a similar definition as the EPA's CPG. However, glass is not listed as a CPG alternative at this time.</p>
<p><b>1.4</b> Is the product 100% recyclable? If NO, please indicate what percentage of the product is recyclable.</p>	<b>Yes</b>			<p>The type of glass will determine recyclability and subsequent application. Clear or low-iron glass (i.e., un-coated glass) may be recycled for almost any application. Tinted, reflective or solar control glasses have fewer applications due to ingredients added to enhance the aesthetics and performance of the glass; but they can still be recycled for bottles, reflectors, glassphalt, and sign-paint applications.</p>

QUESTION		YES or NO	N/A	U/K	COMMENTS
1.5	Is the product a bio-based product (i.e. agricultural or forestry material)? If YES, please indicate the source and bio-based content percentage. If percentage refers to a component rather than the entire product, please specify.		<b>N/A</b>		
1.6	Is the product made from a renewable resource? If YES, indicate the renewable cycle time and what percentage of the product that resource represents.			<b>U/K</b>	Glass is comprised of >70% sand. Industry research indicates that natural geologic processes generate more sand than is consumed. By that definition, sand is a renewable resource. However, in terms of sustainable building products, renewable (or rapidly renewable) typically relates to harvested or bio-based products, not extracted materials. Consequently, sand is not presently categorized as renewable. The other 30% of glass consists of mined raw materials such as dolomite, soda ash and salt cake, which also are plentiful.
1.7	Does the product, in the specified condition of use, meet EPA's National Volatile Organic Compound (VOC) Emission Standards?		<b>N/A</b>		This is not applicable, as glass as a finished product doesn't contain any VOCs to emit.
1.8	Does the product in the specified condition of use, meet the requirements of South Coast Air Quality Management District Regulations for content of VOCs?		<b>N/A</b>		This is not applicable, as glass as a finished product doesn't contain any VOCs to emit.

### Criterion No. 2–Manufacturing

2.1	Has the manufacturer taken steps to minimize the use of non-renewable energy from the point at which raw materials are gathered to the point at which the final product is transported to the building site? If yes, describe these measures.	<b>Yes</b>			The consumption of energy is most significant in the glass manufacturing process and in the generation of power to supply the manufacturing facility (69% of total energy use). (Source: CMU, EIOLCA.net). Each year, PPG invests in engineering projects to reduce the energy consumption at all plant locations. PPG has taken measures to minimize the use of non-renewable energy through proper furnace design, regenerators and heat re-harvesting programs that capture at least 50% of energy otherwise put through the stack. Oxy-fuel technology pioneered by PPG reduces waste heat by approximately 10%; NOx emissions by approximately 70% and energy consumption, including CO2 emissions, by approximately 15%. PPG also has lowered electricity use in its glass plants by 4 to 8 million kilowatts per year (depending on the facility) through lighting system upgrades. Finally, even though transportation impacts account for 3% of energy consumption, PPG utilizes logistical delivery as well as rail delivery for raw materials, where applicable, to minimize diesel transportation.
-----	---	------------	--	--	--

QUESTION		YES or NO	N/A	U/K	COMMENTS
<b>2.2</b>	Is any of the waste produced in making this product reclaimed on-site? If yes, what percentage of the waste is reclaimed? Of the waste that is not reclaimed on-site, how is that waste handled?	<b>Yes</b>			PPG manufacturing reutilizes unused scrap glass in the form of cullet. Nearly 100% of cullet is returned to the manufacturing process. Knowing the chemical composition of the cullet, PPG is able to stockpile the material for reutilization as a feedstock, thereby minimizing the use of virgin materials and energy, since cullet requires less energy to re-melt than virgin sand. Some PPG glass manufacturing facilities have installed electrostatic precipitators, where particulate is captured for reuse as a batch material. Scrap glass that cannot be reused as cullet is properly disposed at permitted landfill sites. Finally, mixed cullet (coated glass that cannot re-enter process) is sometimes generated. This is sold as a pre-consumer waste to companies such as Dlubak and Strategic Materials, which utilize PPG's mixed cullet in various ways. No mixed cullet is sent to landfills.
<b>2.3</b>	Does the process for manufacturing this product avoid the use of listed substances above the levels that would require reporting under the U.S. EPA's Toxics Release Inventory (TRI)? If NO, indicate how much of each substance is released per unit of product.	<b>No</b>			There are various metal oxide compounds (cobalt, chromium, selenium) that are utilized to add performance to glass. Other compounds, such as lead, may be present as trace contaminants in raw materials. Quantity of TRI materials per unit of product is not available, although specific quantities are very small. Such TRI data are reported and can be found on EPA's Envirofacts web site: <a href="http://oaspub.epa.gov/enviro/ef_home2.toxics">http://oaspub.epa.gov/enviro/ef_home2.toxics</a>
<b>2.4a</b>	Does the process for manufacturing the product avoid the addition of substances listed in the National Toxicology Program's Report on Carcinogens?	<b>No</b>			Some of these materials, as explained in 2.3, are necessary for glass performance.
<b>2.4b</b>	If substances listed in the National Toxicology Program's Report on Carcinogens are added directly in the manufacturing process or are reported by suppliers on Material Safety Data Sheets (MSDS), do the concentrations fall below levels required to be reported under federal regulations on the products' MSDS? If NO, indicate the substance, classification and concentration per unit of product.	<b>Yes</b>			The quantities are below trigger thresholds for reporting.
<b>2.5</b>	Have any recent improvements been made to limit negative environmental impacts relating to the manufacturing process? If YES, describe the benchmark against which the improvements are measured and the degree of improvement.	<b>Yes</b>			PPG is the pioneer of oxygen-firing furnaces (called oxy-fuel) for flat glass products, and has implemented this technology at several U.S. locations. This technology improves multiple aspects of the manufacturing process including the reduction of energy consumption, waste heat, and CO <sub>2</sub> and NO <sub>x</sub> emissions. Oxy-fuel technology reduces waste heat by approximately 10%; NO <sub>x</sub> emissions by approximately 70% and energy consumption, including CO <sub>2</sub> emissions, by approximately 15%.

QUESTION	YES or NO	N/A	U/K	COMMENTS
<b>2.6</b> If water is used during the production process, have water conservation or recycling measures, or both, been initiated? If yes, describe the measures and what percentage of the total water usage they address.	<b>Yes</b>			Water consumption in glass manufacturing is minimal, often far less than what is used in office/support areas of the plant. Uses of water in glass manufacturing include process cooling and glass washing. When used for cooling, water does not come in contact with process materials but is retained in a closed loop system. When lost as steam, water levels are replenished with city water. Glass washing occurs prior to storage, tempering or coating. Washwater is collected in reservoirs, filtered, pH-balanced and reused.
<b>2.7</b> Has the manufacturer undertaken any of the following actions? If yes, indicate when the action(s) was (were) taken and describe the benchmark against which the improvements are measured and the degree of improvement.				
<b>2.7a</b> Redesigned a production process to decrease greenhouse gas emissions?	<b>Yes</b>			PPG has implemented oxy-fuel furnace technology, as described in item 2.5 above, on several U.S. float lines. PPG's corporate statement on greenhouse gas emissions and reduction goals can be found on PPG's energy security & climate change website at the following link: <a href="http://corporateportal.ppg.com/PPG/ecologicalsolutions/20_energy/">http://corporateportal.ppg.com/PPG/ecologicalsolutions/20_energy/</a>
<b>2.7b</b> Redesigned a production process to decrease liquid effluents?	<b>Yes</b>			See item 2.6 for response.
<b>2.7c</b> Redesigned a production process to utilize less toxic materials?	<b>Yes</b>			Glass manufacturing is not a significant user of toxic materials. To maximize production efficiency, PPG adjusts furnace firing times and temperatures to accommodate new frit material when discontinuing lead-based frits for logo-stamping. Most process cutting oils have been replaced with water-based evaporating fluids.
<b>2.7d</b> Substituted safer solvents in a production process?		<b>N/A</b>		The minimal solvents used during the glass-cutting processes are comprised of non-hazardous VOCs that are not considered air pollutants under the Clean Air Act. These solvents are not hazardous to the workplace. Glass manufacturing is typically not a solvent user.
<b>2.7e</b> Instituted more stringent dust controls?	<b>Yes</b>			Dust controls are specific to feedstock-mixing prior to furnace input and subsequent manufacturing. PPG updates its particle collection devices (ESPs or baghouses) when end of life, technological advances, or regulatory requirements are in effect. PPG monitors sand particle emissions by taking measurements and continuously adjusting for improvements, which include observing the sizing of the duct work and air bag filtering systems.
<b>2.7f</b> Installed smoke-stack particulate collectors or gas scrubbers?	<b>Yes</b>			PPG utilizes collectors to capture particle emissions from the batch house (where ingredients are mixed). Some furnaces are controlled with electrostatic precipitators. One furnace will soon be equipped with a SCR (selective catalytic reduction) system, which will reduce NOx emissions.

QUESTION		YES or NO	N/A	U/K	COMMENTS
<b>2.7g</b>	Installed or improved in-plant solid and toxic waste reduction programs?		<b>N/A</b>		PPG flat glass manufacturing does not have major waste stream generation. Of the waste that is produced, the majority is non-hazardous, reutilized, or recycled.
<b>2.8</b>	Does the manufacturing facility comply with or exceed applicable occupational, health, and safety requirements?	<b>Yes</b>			Information regarding PPG manufacturing safety can be found at the following link: <a href="http://corporateportal.ppg.com/NA/CORP/EHS/Safety/injury.htm">http://corporateportal.ppg.com/NA/CORP/EHS/Safety/injury.htm</a>

### Criterion No. 3 – Operational Performance of Installed Product

<b>3.1</b>	If applicable, does the product qualify for an EPA ENERGY STAR rating or meet the energy efficiency recommendations of the DOE's Federal Energy Management Program (FEMP)?		<b>N/A</b>		PPG has a long and consistent history of supporting and developing energy conservation programs that promote the efficient use of glass and fenestration products. PPG's commitment to energy conservation includes, but is not limited to, its role as an ENERGY STAR company, and its long-term participation in the ENERGY STAR Homes and ENERGY STAR for Windows, Doors and Skylights programs. PPG manufactures spectrally selective glass and high-performance, low-e coated glasses that enhance the energy performance of today's best architectural window, door and skylight systems. PPG glass technology is featured in many finished assembled fenestration products that qualify for the ENERGY STAR rating or meet the FEMP.
<b>3.2</b>	Describe the product's energy efficiency impacts.				PPG glasses improve the performance of window and door assemblies. The company makes numerous reflective, tinted, passive solar, and solar control low-e coated glasses that deliver improved solar heat gain (SHGC), U-value, visible light transmittance (VLT) and other climate-related benefits. Climate-appropriate glass products reduce heating and cooling loads, which cuts energy use, operating costs and greenhouse gas emissions.
<b>3.3</b>	Describe routine maintenance procedures for the product.		<b>N/A</b>		Other than traditional glass cleaning, maintenance is not required. If an insulated glass unit (IGU) becomes "deficient" there is no maintenance to correct it. It must be replaced.
<b>3.4</b>	How long will the product last in the building if maintained properly with routine maintenance procedures?				Glass has a long life cycle. The only need to replace glass is due to breakage or technological advances that can deliver an acceptable return on investment.
<b>3.5</b>	Does the manufacturer provide detailed instructions with the product upon delivery to the job site for the proper use and maintenance required in order to ensure that this product will last this long?		<b>N/A</b>		PPG glass is fabricated into an insulated glass unit (IGU) or window unit with frame assembly. The fabricator of that final product provides warranties, as well as instructions for proper handling and cleaning.

QUESTION	YES or NO	N/A	U/K	COMMENTS
----------	-----------	-----	-----	----------

**Criterion No. 4–Indoor Environmental Quality**

4.1	Is there any other information about how this product contributes to indoor environmental quality (positively or negatively, e.g. acoustical properties, lighting, potential risks to workers during application, and so forth) that has not already been reported, but that sender of this questionnaire should know? If YES, describe. (If this product is not intended to be used in the indoor environment or to interface with the occupants, indicate N/A.)	Yes		Windows with PPG glass technology meet a variety of objectives in building projects, including improved daylighting, ventilation, aesthetics, noise reduction, security, building envelope protection, thermal performance, emergency escape and rescue, and more. In many parts of the U.S., natural ventilation provided by operable windows offers a seasonal opportunity for air-conditioning energy savings if included as part of the HVAC design, balancing and operating plan. Operable windows also contribute to “Ventilation Effectiveness” and “Controllability of Systems.” Many building studies have documented the salutary effects of natural daylight and ventilation on office worker productivity and wellness, and student learning. Windows also enhance the psychological well-being of building occupants and help buildings meeting fire safety code requirements.
-----	---	-----	--	---

**Criterion No. 5–Corporate Environmental Policy**

5.1	Does the manufacturer have a written environmental policy? If YES, indicate how the sender of this questionnaire could obtain a copy of this policy upon request.	Yes		The environmental policy can be downloaded from PPG Environmental, Health and Safety website at the following link: <a href="http://corporateportal.ppg.com/NA/CORP/EHS/TopNav/Commitment/EHS+VP+Commitment.htm">http://corporateportal.ppg.com/NA/CORP/EHS/TopNav/Commitment/EHS+VP+Commitment.htm</a>
5.2	Does the manufacturer have a reclamation program or any other program in place to facilitate the recycling or reuse of its product by accepting return of the product at the end of its useful life? If NO, comment on the environmental impact of the product as a waste material. If yes, comment on how much of the product is actually reused or recycled at the end of the product’s useful life.	No		The type of glass will determine its recyclability. Clear or low-iron glass may be recycled. Tinted, reflective or solar control glasses may not be recyclable due to ingredients added to enhance their aesthetics and performance. However, an infrastructure for the post-consumer recycling of glass already exists in the marketplace.
5.3	Does the manufacturer have a program in place to reduce the amount of the product’s packaging? If YES, describe.	Yes		PPG utilizes steel racks when shipping glass, which are returned for re-shipping. There is minimal packaging material, other than plastic wrap and polystyrene foam to secure and protect the corners during shipping. No cardboard is used.
5.4	Does the manufacturer have a program in place to facilitate the return, reuse, recycling or composting of the product’s packaging? If YES, describe.	Yes		PPG utilizes steel racks when shipping glass, which are returned for re-shipping.
5.5	Does the manufacturer provide information on the service life of the product or encourage the use of professional guidelines to determine the service life of the product?	No		Glass has a long life cycle. The only need to replace glass is due to breakage or technological advances that can deliver an acceptable return on investment.

QUESTION	YES or NO	N/A	U/K	COMMENTS
5.6 Does the manufacturer provide information regarding natural disaster mitigation, such as performance of the product during a natural disaster or appropriate response after a natural disaster?		N/A		
5.7 Is documentation available to support the product's environmental claims? If YES, please indicate how copies may be obtained upon request.	Yes			White papers on solar control low-e coating technology and potential energy savings can be found at the below link: <a href="http://corporateportal.ppg.com/NR/rdonlyres/E95825C0-4EBC-4324-AF8E-BBF1A4BE7ABF/0/PPGSolarban70XL_Web2d.pdf">http://corporateportal.ppg.com/NR/rdonlyres/E95825C0-4EBC-4324-AF8E-BBF1A4BE7ABF/0/PPGSolarban70XL_Web2d.pdf</a>
5.8 Is there other information, for which you could provide objective evidence, about the environmental quality of the building product you offer that you would like taken into consideration? If YES, describe the information and indicate how copies of this evidence could be obtained upon request.		N/A		August 2008, all PPG coated and uncoated glass was <i>Cradle to Cradle Certified (C2C)</i> at the silver level by MBDC. C2C products contribute to a LEED project for innovation credits. PPG earned the first C2C Certification for architectural glass. <a href="http://www.c2ccertified.com/">http://www.c2ccertified.com/</a>

Questionnaire Completed by: James Bogdan, Manager, Sustainable Design Initiatives  
PPG Industries, Construction Market Team  
[bogdan@ppg.com](mailto:bogdan@ppg.com)  
412-434-2937

Questionnaire Details and Comments Investigated with:  
Glass Manufacturing Plant Management, Procurement, Engineering,  
and Environmental Health & Safety Departments



PPG Glass, Coatings and Paint for Sustainable Design

(888-PPG-IDEA)

[www.ppgideascales.com](http://www.ppgideascales.com)



©2009 PPG Industries, Inc. Atlantica, Azuria, Caribia, Oceans of Color, Solarcool, Solexia, Solarban, Sungate, Vistacool, IdeaScapes, the PPG logo and the PPG IdeaScapes logo are trademarks owned by PPG Industries. EcoLogical Building Solutions is a service mark owned by PPG. Cradle to Cradle<sup>CM</sup> is a certification mark of MBDC.

7128/2-09