



# 3form<sup>®</sup> Chroma<sup>®</sup> acrylic panels

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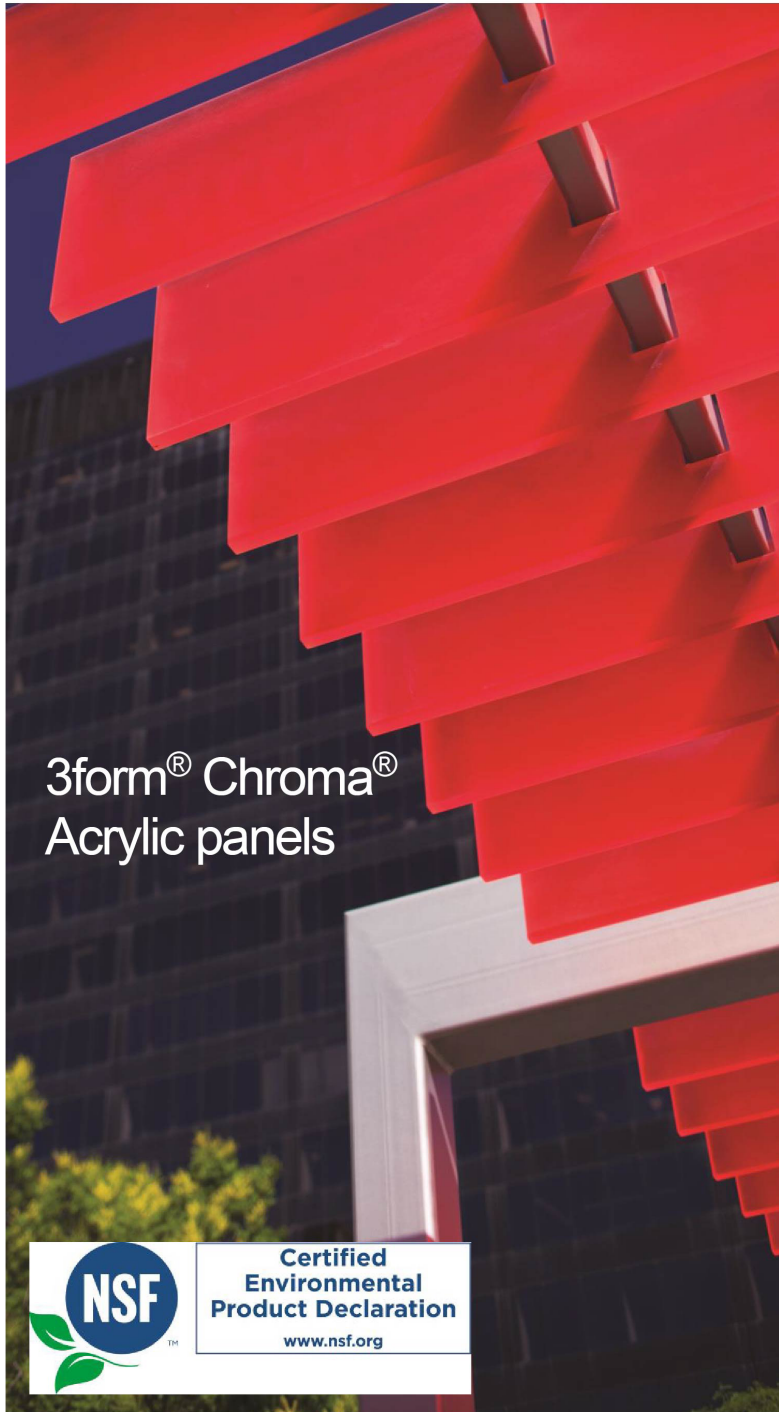
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3form<sup>®</sup> Chroma<sup>®</sup>  
Acrylic panels



**Certified  
Environmental  
Product Declaration**  
[www.nsf.org](http://www.nsf.org)

3form Chroma<sup>®</sup> is produced from optical grade engineered resin. Chroma is available in thick-gauge formats, which lends itself well for use in many horizontal applications.

Chroma is a highly functional material that makes an impact when color is introduced. Produced with brilliant colors, Chroma can be layered to create an enormous range of hues, opacities, and amazing effects.

The surface of Chroma features a durable, renewable matte texture that can be easily refinished throughout its lifetime.

### Environmental Information

Declared Unit 1 meter squared  
Mass per Declared Unit 26.5 kg

#### Quantities per Declared Unit

#### Life Cycle Impact Assessment [CML 2001]

	Unit	Quantity
Global Warming	[kg CO <sub>2</sub> -eq]	111
Acidification	[kg SO <sub>2</sub> -eq]	0.293
Eutrophication	[kg Phosphate-eq]	0.0331
Ozone Depletion	[kg R11-eq]	8.95E-09
Photochemical Ozone Creation	[kg Ethene-eq]	0.0429
Abiotic Depletion, Elements	[kg Sb-eq]	3.70E-05
Abiotic Depletion, Fossil	[MJ]	2,120

#### Life Cycle Inventory Indicators

Secondary Materials	[kg]	10.0
Secondary Fuels	[MJ]	0
Freshwater Use	[m <sup>3</sup> ]	1.10
Non-renewable Energy	[MJ]	2,250
Renewable Energy	[MJ]	145
Hazardous Waste	[kg]	0
Non-hazardous Waste	[kg]	0.334
Radioactive Waste	[kg]	0.0487

EPD Information			
Program Operator		NSF International	
Declaration Holder		3form	
Product Chroma	Date of Issue 10/29/2014	Period of Validity 3 years	Declaration Number EPD10039
This EPD was independently verified by NSF International in accordance with ISO 14025:  <input type="checkbox"/> Internal <input checked="" type="checkbox"/> External		  Tom Bruursema Bruursema@nsf.org	
This life cycle assessment was independently verified by in accordance with ISO 14044 and the reference PCR:		  Jack Geibig jgeibig@ecoform.com	
LCA Information			
Basis LCA		Life Cycle Analysis of Building Panels 9/19/2014	
		PE International Takuma Ono T.Ono@pe-international.com	
This life cycle assessment was critically reviewed in accordance with ISO 14044 by:		Jack Geibig EcoForm jgeibig@ecoform.com	
PCR Information			
Program Operator		The International EPD System	
Reference PCR		Construction Products and CPC 54 Construction Services	
Date of Issue		March 15, 2103	
PCR review was conducted by:		Martin Erlandsson, IVL Swedish Environmental Research Institute martin.erlandsson@ivl.se	

**Environmental Programs  
and Policies**

**Sustainability Statement**

We believe that we must be responsible for our products through their entire life-cycle, with a diligent focus on the balance of people, planet, and profit.

**Sustainability Platform**

3form's sustainability initiatives are collectively known as Path to Zero, and include five main directives designed to minimize our footprint, while we create awardwinning building materials and architectural hardware solutions for the Architecture + Design industry:

- Zero Waste 1** Furthering 3form's successful zero-waste-to-landfill initiative, we have begun a path to become a Zero Waste manufacturing facility. This will be done through aggressive recycling, reduced waste creation, and innovative manufacturing.
- Carbon Neutrality 2** 3form is committed to energy and fuel efficiency measures, and the purchase of renewable energy credits (RECs) and verified emission reductions (VERs) to offset those emissions we do cause through our operations.
- Responsible Manufacturing 3** Social responsibility as well as environmental awareness have been integrated into 3form's manufacturing ethos.

  - Globally focused social equity is built through 3form's innovative Full Circle program, in which we direct-source artisan materials from developing regions in a manner that provides improved economic opportunity and health and education benefits, while also helping to protect community and cultural integrity.
  - Local social equity is also enhanced through corporate philanthropy, employee benefit programs, community engagement, and volunteerism.
  - Focused Life Cycle Assessments on 3form products, as well as awareness of material inputs, resource usage, and continuing improvements in manufacturing ensures 3form products meet stringent quality standards while making the least impact footprint from cradle to gate.
  - Incorporation of recycled materials is a hallmark of 3form, where product development teams work to create innovative products that use less virgin materials or non-renewable resources. Varia Ecoresin®, a flagship 3form product, contains an average of 40% preconsumer content, while other 3form products contain up to 100% recycled content.
  - Reclaim and Reform programs have been established to help ensure responsible management of 3form products, after their service life is over. Through these waste-reduction initiatives, 3form will take back used panels, and repurpose imperfect panels to give them another life and prevent them from entering the waste stream.
- Materials Transparency 4** Many 3form materials have independent certifications attesting to recycled content, indoor air quality friendly qualities, and other beneficial attributes. With a growing focus on healthy buildings, we have been investing in creating Environmental Product Declarations (EPDs), and Health Product Declarations (HPDs), to offer an exceptional level of transparency and assurance to our customers.
- Employee Engagement 5** This is 3form's sustainability in action by our team. On-going trainings, in-house audits, sustainability-focused clinics and activities, commute reduction rewards and consistent sustainability feedback help ensure that employees contribute to our goals, as well as have a personal understanding of their importance. We believe that sustainability should extend beyond 3form's workplace, and encourage employees to lessen their individual footprints in their daily lives.



## Sustainability Programs and Initiatives



### US Green Building Council

As a long-time member of the USGBC, 3form recognizes the importance of the LEED rating system to sustainable design. 3form materials help achieve LEED credits across a number of categories and were selected for use in the USGBC's headquarters in Washington DC. We are committed to promoting sustainable building practices and education through our national and local Chapter memberships.



### The Climate Registry

3form achieved Climate Registered™ status by successfully measuring our carbon footprint according to The Climate Registry's best-in-class program, then having it third party verified and voluntarily reporting the data on The Climate Registry's website.



### ISO 14001:2004

Environmental management standards to help organizations minimize how their operations negatively impact the environment; comply with applicable laws, regulations, and other environmentally-oriented requirements; and make continual improvements. 3form's facilities are certified ISO 14001.



### Scientific Certification Systems

Offers a variety of certifications, including one for the use of recycled materials. All claims are certified in accordance with U.S. FTC Guides for the Use of Environmental Marketing Claims and ISO 14021 standards. Chroma is SCS certified for 38% recycled content.



### GREENGUARD

Third party certification gives assurance that products and building materials designed for use indoors meet strict chemical emissions limits. Includes performance-based standards to define products and processes with low chemical and particle emissions.



### EPA Green Power Partnership

A voluntary program of the U.S. EPA that recognizes companies for their procurement of green power. 3form is a member of the Green Power Leadership Club.



### Salt Lake City e2 Business

The Salt Lake City environmentally and economically sustainable (e2) business program is designed to recognize and support the Salt Lake City business community and economy. 3form is an e2 Business.



### Emissions Offset

Through 3Degrees, 3form supports Green-e Climate certified renewable energy projects. These projects avoid greenhouse gas emissions and help us offset the emissions we generate in our operations and business travel.

**Comparability**

This EPD meets the requirements for comparability with products evaluated in accordance to the guiding PCR document. EPDs from different programs may not be comparable.



**Specification of the Product**

General, mechanical, optical, and thermal specifications for Chroma panels are summarized in Table 1.

PROPERTY	ASTM METHOD	TYPICAL VALUES	
		US CUSTOM	METRIC
<b>GENERAL</b>			
Declared Unit			1 m <sup>2</sup>
Panel Mass			26.5 kg
Panel Gauge			2.23 cm
Panel Volume			0.023 m <sup>3</sup>
Density	D1505	74.3 lb/ft <sup>3</sup>	1,190 kg/m <sup>3</sup>
Water Absorption	D579 24hrs @ 73°F	0.20%	0.20%
<b>MECHANICAL</b>			
Tensile Strength	D638	10,000 psi	69 MPa
Elongation at Rupture	D638	4.50%	4.50%
Tensile Modulus	D638	400,000 psi	2800 MPa
Flexural Strength (rupture)	D790	17,000 psi	117 MPa
Flexural Modulus	D790	480,000 psi	3300 MPa
Compressive Strength (yield)	D695	17,000 psi	117 MPa
Compressive Deformation	D621 4000 psi, 122°F, 24 hours)	≤0.85%	
Shear Ultimate Strength	D732	10,000 psi	703 kg/cm <sup>2</sup>
Shear Modulus	D5279	167,000 psi	1151 MPa
Impact Strength (charpy method)	D256 notched	2.1 lbf*in/in	0.9 kgf*cm/cm
	D256 un-notched	7 lbf*in/in	3.17 kgf*cm/cm
Izod Impact Strength	D256 notched	≤0.25 ft-lb/in	≤13.3 J/m
Rockwell Hardness	D785	M-93	M-93
Barcol Hardness	D2583	48	48
Residual Shrinkage (internal strain)	D702	2%	2%
Coefficient of Friction	D2047 dry	0.73	
	D2047 wet	0.79	
Poisson's Ratio	E132	0.35-0.40	
<b>OPTICAL</b>			
Refractive Index	D542	1.49	1.49
Light Transmission (total)	D1003	92%	92%
Haze	D1003	<1%	<1%
<b>THERMAL</b>			
Max Continuous Use Temperature		180°F	82°C
Max Instantaneous Use Temperature		212°F	100°C
Deflection Temperature	D648 @ 264 psi	195°F	90°C
Vicat Softening Point	D1525	239°F	115°C
Forming Temperature		300-330°F	149-157°C
Coefficient of Thermal Conductivity (k-factor)	cenco-fitch	1.3 btu/(hr)ft <sup>2</sup> (°F)	0.19 w/m <sup>2</sup> K
Coefficient of Thermal Expansion	D696 @ 60°F (16°C)	4.0 x 10 <sup>-5</sup> (in/in/°F)	7.2 x 10 <sup>-5</sup> (mm/mm/°C)

**Table 1: Select mechanical and physical properties for 3form Chroma**

**Relevant Functional Properties**

3form Chroma conforms to the 2009 International Building Code® for light-transmitting plastics. The provisions of these codes provide adequate regulation for most applications of light-transmitting plastics [unless otherwise noted, data is based on 0.236" (6 mm) thickness]:

TEST	3FORM CHROMA	RESULT
ASTM D 2843 Smoke Density	0.041	PASS Less than 75
ASTM D 635 Flame Spread	Rate of burning: 1.2 in/min	PASS CC2
ASTM D 1929 Self-ignition Temp.	852°F	PASS Greater than 650°F
ASTM E 84-03		
Flame Spread, 1" Thickness	115	Class C (76-200)
Smoke Developed	150	450 (less than 450)

**Table 2: Relevant ASTM standards applicable to Chroma panels**



**Declared Unit and Reference Flow**

Since this analysis follows a basic module PCR, specific functions for each product category were not defined and are not necessary under the cradle-to-gate system boundary. Therefore, all products were evaluated on a per-m<sup>2</sup> basis will be analyzed under the declared unit of 1 m<sup>2</sup> of panel product as sold by 3form.

The reference flow was determined by calculating the average Chroma panel gauge produced in 2013, weighted by production masses. The reference flow for Chroma panels is 26.5 kg.



**Content of Material and Chemical Substances**

Chroma panels are comprised nearly entirely of acrylic resin, with an SCS certified recycled content of 38%. Minimal amount (<1%) of polyethylene film is also included. A minimum of 99% of weight of the product is included in the declaration.



**System Boundaries**

The PCR requires, at minimum, to report environmental impacts of activities up to the factory gate, with subsequent life cycle stages optionally reported. This is considered by the PCR to be the cradle-to-gate system boundary. Life cycle stages beyond the gate (transportation to installation site, installation, maintenance, deconstruction, disposal, and recycling) are not considered in this declaration (refer to Table 3).

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE (not relevant)							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D

**Table 3: The declared EN 15804 aggregation modules (A1, A2, A3) shown in bold blue borders**

In accordance with the PCR, the reference service life (RSL) is not specified.

The geographic scope of the system is in North America; thus, the geographic validity of the EPD is also North America.

Electricity consumption is entirely from the regional grid mix of Salt Lake City.





## Environmental Impact Potentials

This section contains the absolute results for each product per the declared unit (Table 4) and a visual breakdown of the relative impacts (Figure 1), allowing for a more intuitive understanding of where impacts occur in the product life cycle. Biogenic carbon is excluded in the global warming potential calculations. The environmental inventory and impacts are reported per EN 15804, as follows:

### Environmental Impacts (CML 2001 and TRACI 2.1)

GWP	Global warming potential
ODP	Depletion potential of the stratospheric ozone layer
AP	Acidification potential of land and water
EP	Eutrophication potential
POCP	Formation potential of tropospheric ozone photochemical oxidants
ADPE	Abiotic depletion potential for non-fossil resources
ADPF	Abiotic depletion potential for fossil resources
POCP/SFP	Photochemical Ozone Creation Potential / Smog formation potential

### Resource Use

PENRT	Total use of non-renewable primary energy resources
PENRE	Use of non-renewable primary energy excluding non renewable primary energy resources used as raw materials
PENRM	Use of non-renewable primary energy resources used as raw materials
PERT	Total use of renewable primary energy resources
PERE	Use of renewable primary energy excluding renewable primary energy resources used as raw materials;
PERM	Use of renewable primary energy resources used as raw materials
SM	Use of secondary material
SF	Use of secondary renewable fuel
FW	Use of net fresh water

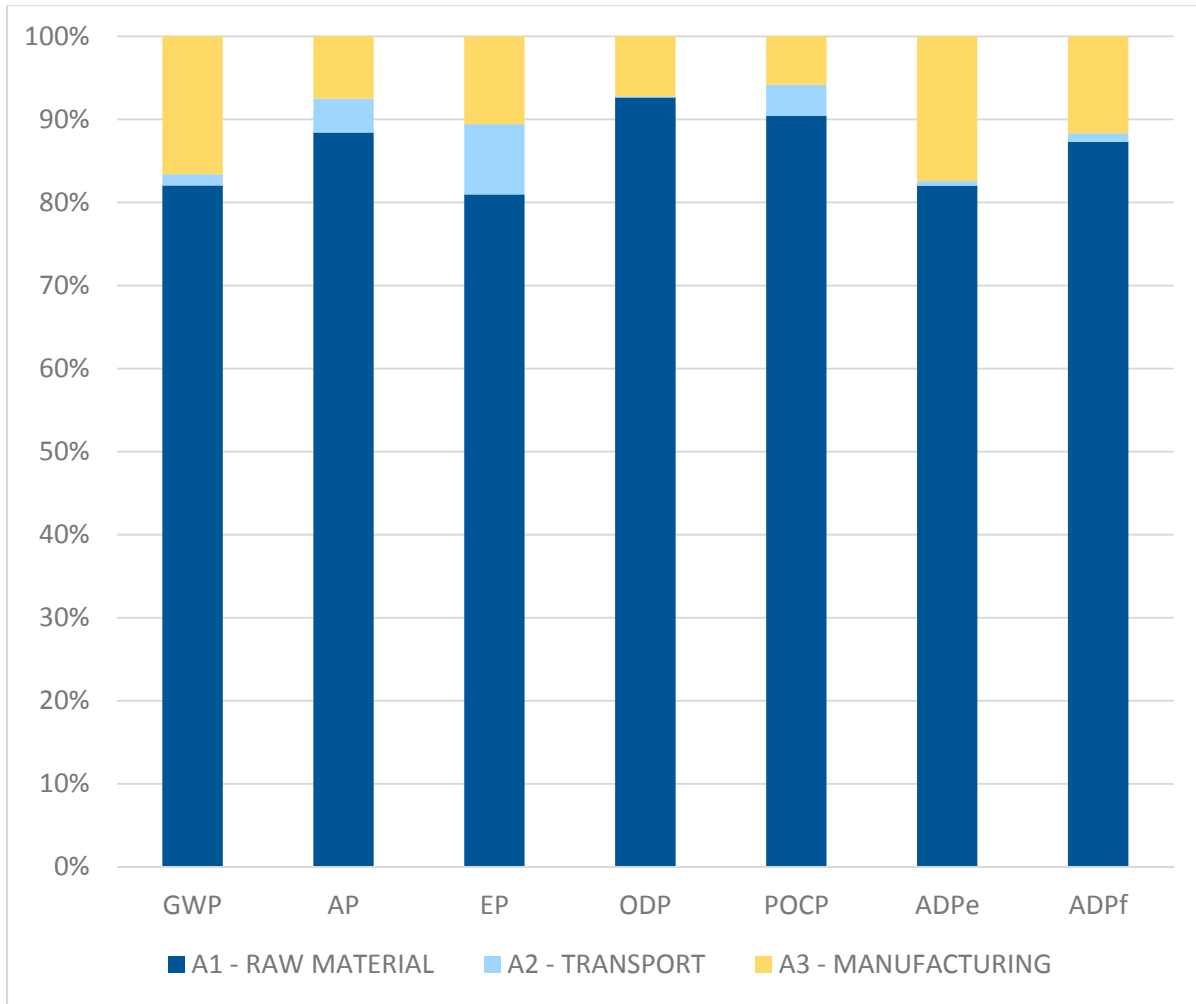
### Output Flows and Waste Categories

HWD	Hazardous waste disposed
NHWD	Non-hazardous waste disposed
RWD	Radioactive waste disposed

	UNIT	TOTAL	A1 - RAW MATERIAL	A2 - TRANSPORT	A3 - MANUFACTURING
<b>CML 2001 – April 2013</b>					
GWP	kg CO <sub>2</sub> -eq	111	90.9	1.51	18.4
AP	kg SO <sub>2</sub> -eq.	0.293	0.260	0.0115	0.0217
EP	kg Phosphate-eq	0.0331	0.0268	2.79E-03	3.51E-03
ODP	kg R11-eq.	8.95E-09	8.29E-09	1.28E-11	6.46E-10
POCP	kg Ethene-eq.	0.0429	0.0388	1.59E-03	2.50E-03
ADPe	kg Sb-eq.	3.70E-05	3.03E-05	1.94E-07	6.44E-06
ADPf	MJ	2120	1850	21.7	248
<b>TRACI 2.1</b>					
GWP	kg CO <sub>2</sub> -eq.	111	90.9	1.51	18.4
AP	kg SO <sub>2</sub> -eq.	0.291	0.251	0.0154	0.0243
EP	kg N-eq.	0.0734	0.0684	9.82E-04	4.03E-03
ODP	kg CFC11-eq.	9.51E-09	8.81E-09	1.36E-11	6.87E-10
SFP	kg O <sub>3</sub> -eq.	3.69	2.71	0.515	0.465
<b>Use of Resources</b>					
SM	kg	10.0	10.0	0	0
SF	MJ	0	0	0	0
FW	m <sup>3</sup>	1.10	0.913	1.50E-03	0.189
PENRT	MJ	2250	1970	21.8	253
PENRE		2250	1970	21.8	253
PENRM		0	0	0	0
PERT	MJ	145	104	1.36E-01	40.6
PERE		104	63.1	1.36E-01	40.6
PERM		41.2	41.2	0	0
<b>Other Indicators Describing Waste Categories</b>					
HWD	kg	0	0	0	0
NHWD	kg	3.34E-01	3.34E-01	0	0
RWD	kg	4.87E-02	4.68E-02	4.51E-05	1.88E-03

**Table 4: CML and TRACI LCIA impacts, resource use, and waste categories for Chroma acrylic panels, by EN 15804 life cycle modules**

Figure 1 shows visually that the module A1 – *Raw materials* is the dominant contributor cross all CML impact categories. The A1 module includes the primary panel resin and primary packaging materials. Moreover, 3form procures panels from extruders, which are finished to specification at the Salt Lake City facility. Therefore, the extrusion process is considered an upstream burden, and not included in the module A3 – *Manufacturing*. When the 3form supply chain is apportioned to the EN 15804 life cycle modules, only the energy, water, and wastes generated during finishing is attributed to the A3 module. Transportation was found to be a minor contributor to all impact categories.



**Figure 1: CML 2001 impacts by EN15804 life cycle modules**

The declared impacts represent the production-weighted average Chroma panel gauge of 2.23 cm. However, 3form offers Chroma panels ranging from 0.0794 cm to 7.62 cm. Assuming the LCIA scales linearly by panel gauge, Chroma panels can range from 4% to 342% of the declared quantities, depending on the product gauge.

### Interpretation

Chroma is SCS certified to be comprised of 38% recycled content. A production-weighted average Chroma with 38% recycled content achieves a 22% lower GWP impact when compared to an equivalent production-weighted Chroma panel with no assumed recycled content, as seen in Figure 2. Similar reductions occur in the other CML impact categories.

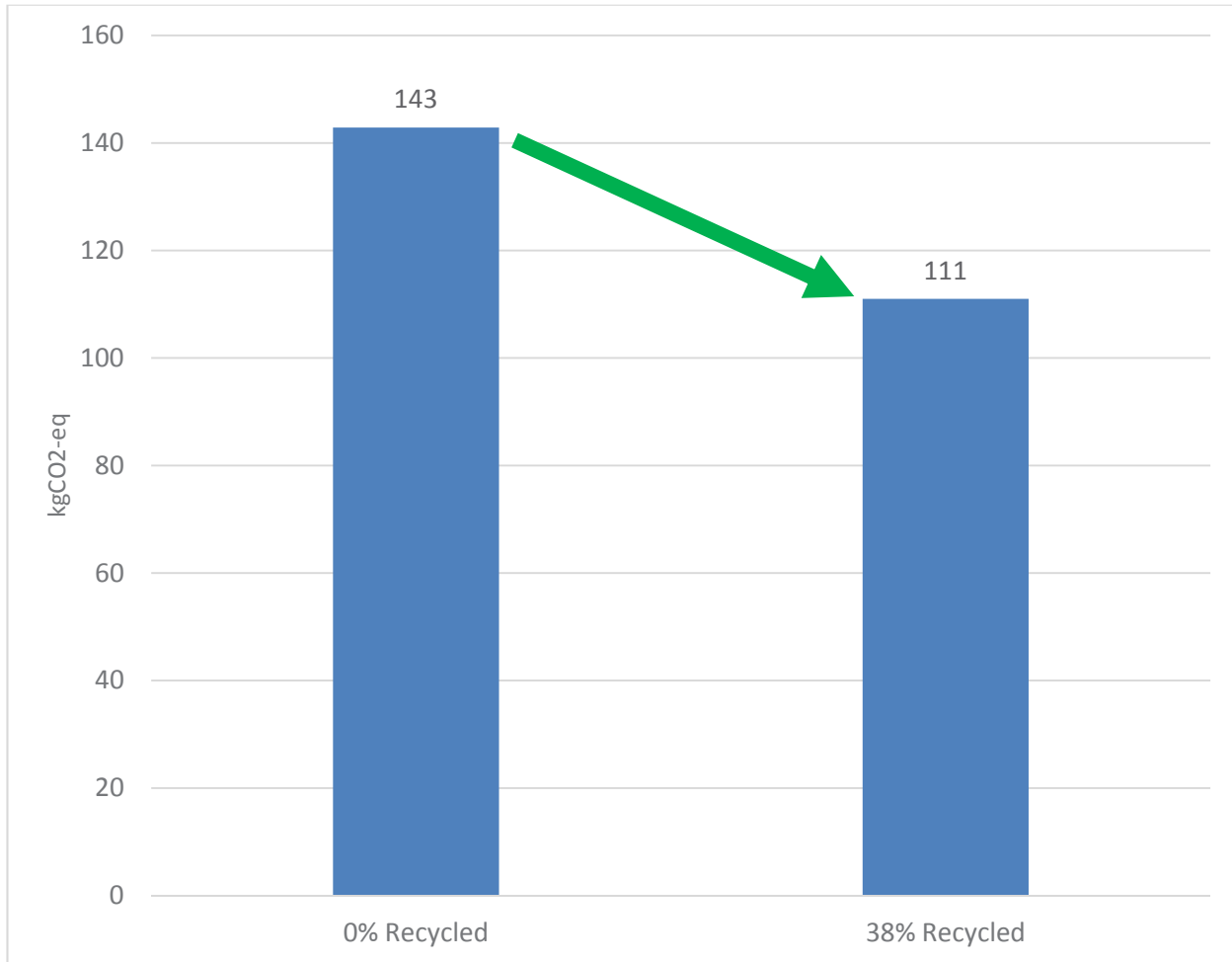


Figure 2: GWP of a 38% recycled acrylic Chroma panel compared to Chroma panel with no recycled content (source: background LCA report, section 6.2, pg 33 - 35)

### Release of Substances During the Use Stage

3form Chroma has a GREENGUARD Gold Certification and tested in accordance with UL 2821 test method to show compliance to emission limits on UL 2818. Section 7.1 and 7.2.



## Additional Environmental Information

### Cleaning and Maintenance Guidance

One of the unique benefits of 3form Chroma is its ability to be refinished. If 3form Chroma needs to be refinished for any reason, the panels may be renewed by sanding. Make sure to sand the entire surface to obtain a uniform finish over the whole panel.

3form Chroma, like all thermoplastic materials should be cleaned periodically. A regular cleaning program will help to maintain the aesthetics and life of the material. 3form recommends the use of Novus® No. 1 and Brillianize® plastic cleaners. Both products are specifically for use on plastics and help panels to resist finger marking and static.

Rinse or wipe the sheet with lukewarm water. Remove dust and dirt from 3form Chroma with a damp, soft cloth or sponge and a solution of mild soap and/or liquid detergent in water. Rinse or wipe the 3form Chroma again thoroughly with lukewarm water. For more stubborn stains, dirty spots or grease, surface cleaners like Fantastik® or Formula 409® also work well. A Scotch Brite® sponge can also help remove tough grease stains. After all cleaning steps, be sure to rinse thoroughly with lukewarm water.

Always use a soft, damp cloth to blot dry. Rubbing with a dry cloth can scratch the material and create a static charge. Never use scrapers or squeegees on 3form Chroma. Also, avoid scouring compounds, gasoline, benzene, acetone, carbon tetrachloride, certain deicing fluids, lacquer thinner, or other strong solvents.

### Disposal, Recycling, and Reuse

This product is not regarded as hazardous waste. Dispose in accordance with local regulations. 3form recommends Chroma panels be recycled or placed into other suitable uses whenever possible.

As part of sustainability commitments, 3form takes responsibility for its products over their entire life cycle, when possible. 3form Reclaim program reuses and recycles materials removed from installations or from full-sized panels damaged in production. Pieces available through Reclaim meet 3form's rigorous quality control standards, and are considered first-quality, with professional trimming to final size, as listed.

3form also offers the Reform program, in which materials are made available at low cost. Reform materials are considered second-quality.

For more information, see <http://www.3-form.com/reclaim>.

 **References**

CML 2001	Guinée et al. “An operational guide to the ISO-standards (Centre for Milieukunde (CML), Leiden 2001.” Center for Environmental Sciences (CML) at the University of Leiden, The Netherlands. Last Updated 2010.
EN 15804	European Committee for Standardization (CEN). “EN15804:2012. Sustainability of construction works – Environmental product declarations— Core rules for the product category of construction products”
GaBi Databases 2013	PE International Inc. “GaBi Databases 2013”. November 2013. Documentation available at <a href="http://database-documentation.gabi-software.com/support/gabi/">http://database-documentation.gabi-software.com/support/gabi/</a>
ISO 14040	International Standard Organization. ISO 14040:2006-10, Environmental management – Life cycle assessment – Principles and framework (ISO 14040:2006).” German and English version EN ISO 14040:2006. Geneva. 2006
ISO 14044	International Standard Organization. “ISO 14044:200610, Environmental management – Life cycle assessment – Requirements and guidelines (ISO 14044:2006).” German and English version EN ISO 14044:2006 Geneva. 2006
EPD 2012	The International EPD System. 2012, January. Product Category Rules: Construction Products and CPC 54 Construction Services. Version 1.2.
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 **Contact Information**



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