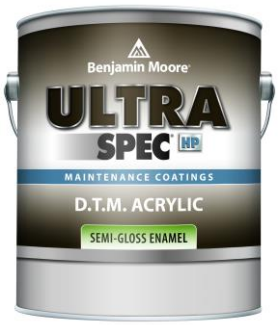
Benjamin Moore & Co.
101 Paragon Drive
Montvale, NJ 07645

Environmental Product Declaration – Ultra Spec® HP DTM Acrylic Enamels

Ultra Spec® HP DTM Acrylic Enamels are professional-quality paints designed to provide superior rust inhibition, corrosion control and protection for metal substrates. The improved acrylic formula offers color and gloss retention, easier application and is tinted with our patented Gennex® colorant system. Visit www.benjaminmoore.com for more information.

The product image to the right is an example of one of the formulas covered by the EPD. A list of all relevant formulas is shown in Table 2 in this EPD.



Declaration Holder	Benjamin Moore & Co. (email: info@benjaminmoore.com); website: www.benjaminmoore.com for additional information)
Declaration Number	EPD10102
Declared Product	Ultra Spec® HP DTM Acrylic Enamels
Product Category and Subcategory	Architectural Coatings – Interior Architectural Coatings
Program Operator	NSF International (ncss@nsf.org)
PCR	PCR for Architectural Coatings – 7-18-2015
Date of Issue	August 31, 2017
Period of Validity	5 years from date of issue
Product Contents	See Table 2

The PCR review was conducted by	Thomas P. Gloria, PhD – Industrial Ecology Consultants (t.gloria@industrial-ecology.com)	
This EPD was independently verified by NSF International in accordance with ISO 21930 and ISO 14025. ☐ Internal ☒ External	Jenny Oorbeck joorbeck@nsf.org	
This life cycle assessment was independently verified in accordance with ISO 14044 and the PCR by ☐ Internal ☒ External	Jack Geibig - EcoForm jgeibig@ecoform.com	

Functional Unit	1m^2 of covered and protected substrate for a period of 60 years (the assumed average lifetime of a building)
Market-Based Lifetime Used in Assessment	5 years
Design Lifetime Used in Assessment	15 years (see Table 4)
Test Methods Used to Calculate Design Life	MPI 114, MPI 141, MPI 153, MPI 154, and MPI 164
Estimated Amount of Colorant	Varies (see Table 4)
Data Quality Assessment Score	Very good
Manufacturing Location(s)	All Benjamin Moore manufacturing locations in the United States producing the products listed in this EPD.

In order to support comparative assertions, this EPD meets all comparability requirements stated in ISO 14025:2006. However, differences in certain assumptions, data quality, and variability between LCA data sets may still exist. As such, caution should be exercised when evaluating EPDs from different manufacturers, as the EPD results may not be entirely comparable. Any EPD comparison must be carried out at the building level per ISO 21930 guidelines. The results of this EPD reflect an average performance by the product and its actual impacts may vary on a case-to-case basis.

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Product Definition and Characteristics

Ultra Spec® HP DTM Acrylic Enamels have been designed to perform dual purpose as direct to metal and primer finish. Both applications of the product provide rust inhibition for superior corrosion control. The film is fast drying permitting fast recoat. These products are also an excellent finish for masonry, plaster, wallboard and interior wood surfaces. This product line is available in low-lustre, gloss and semi-gloss finishes in over 3,500+ Benjamin Moore colors.

The Benjamin Moore® Advantage

Over 5,000 independent retailers and 200+ field and architectural representatives ready to help you. Benjamin Moore provides a full selection of premium and commercial products for every job as well as an architectural support program to help you specify the right products for any job. To find a Benjamin Moore representative in your area, visit www.benjaminmoore.com or call 866-708-9180.

Product Classification and Description

The products listed in Table 1 are included within this assessment. The primary differences between these products are gloss levels (sheen) and base types. For additional information on each of the specific products, please visit www.benjaminmoore.com.

Table 1: List of Ultra Spec® HP DTM Acrylic Enamel formulas assessed by LCA model and report

EPD Product Name	Product Number	Sheen	PCR Base Type
Ultra Spec® HP DTM Acrylic Enamel- Low Lustre Finish and White Base	HP2508	Low Lustre	None
Ultra Spec® HP DTM Acrylic Enamel- Low Lustre Finish and 1X Base	HP251X	Low Lustre	Light Base
Ultra Spec® HP DTM Acrylic Enamel- Low Lustre Finish and 2X Base	HP252X	Low Lustre	Pastel Base
Ultra Spec® HP DTM Acrylic Enamel- Low Lustre Finish and 3X Base	HP253X	Low Lustre	Deep Base
Ultra Spec® HP DTM Acrylic Enamel- Low Lustre Finish and 4X Base	HP254X	Low Lustre	Accent Base
Ultra Spec® HP DTM Acrylic Enamel- Low Lustre Finish and Ready Mix	HP2564	Low Lustre	None
Ultra Spec® HP DTM Acrylic Enamel- Low Lustre Finish and Ready Mix	HP2582	Low Lustre	None
Ultra Spec® HP DTM Acrylic Enamel- Low Lustre Finish and Ready Mix	HP2515	Low Lustre	None
Ultra Spec® HP DTM Acrylic Enamel- Low Lustre Finish and Ready Mix	HP2521	Low Lustre	None
Ultra Spec® HP DTM Acrylic Enamel- Gloss Finish and White Base	HP2808	Gloss	None
Ultra Spec® HP DTM Acrylic Enamel- Gloss Finish and 1X Base	HP281X	Gloss	Light Base
Ultra Spec® HP DTM Acrylic Enamel- Gloss Finish and 2X Base	HP282X	Gloss	Pastel Base
Ultra Spec® HP DTM Acrylic Enamel- Gloss Finish and 3X Base	HP283X	Gloss	Deep Base
Ultra Spec® HP DTM Acrylic Enamel- Gloss Finish and 4X Base	HP284X	Gloss	Accent Base
Ultra Spec® HP DTM Acrylic Enamel- Gloss Finish and Ready Mix	HP2821	Gloss	None
Ultra Spec® HP DTM Acrylic Enamel- Gloss Finish and Ready Mix	HP2882	Gloss	None
Ultra Spec® HP DTM Acrylic Enamel- Semi-gloss Finish and White Base	HP2908	Semi-gloss	None
Ultra Spec® HP DTM Acrylic Enamel- Semi-gloss Finish and 1X Base	HP291X	Semi-gloss	Light Base
Ultra Spec® HP DTM Acrylic Enamel- Semi-gloss Finish and 2X Base	HP292X	Semi-gloss	Pastel Base
Ultra Spec® HP DTM Acrylic Enamel- Semi-gloss Finish and 3X Base	HP293X	Semi-gloss	Deep Base

Ultra Spec® HP DTM Acrylic Enamel- Semi-gloss Finish and 4X Base	HP294X	Semi-gloss	Accent Base
Ultra Spec® HP DTM Acrylic Enamel- Semi-gloss Finish and Ready Mix	HP2964	Semi-gloss	None
Ultra Spec® HP DTM Acrylic Enamel- Semi-gloss Finish and Ready Mix	HP2982	Semi-gloss	None
Ultra Spec® HP DTM Acrylic Enamel- Semi-gloss Finish and Ready Mix	HP2921	Semi-gloss	None
Ultra Spec® HP DTM Acrylic Enamel- Semi-gloss Finish and Ready Mix	HP2915	Semi-gloss	None

Under the Product Category Rule (PCR) for Architectural Coatings, all of the Ultra Spec® HP DTM Acrylic Enamels products fall under the General exterior and interior coatings category. All Ultra Spec HP DTM Acrylic Enamel products described in this EPD are considered as Interior Architectural Coatings.
In the paint manufacturing process, pigments, resin, solvents, and additives are mixed together to form a paste. This pigment-based paste is then processed to disperse the pigment into additional solvent. Finally, this paste is thinned with the proper amount of solvent to form the final product. In addition to the materials associated with paint production, other inputs to the production process include electrical energy, process water, and metal, plastic, and paper packaging materials. The outputs of this manufacturing stage include packaged paint products, waste for disposal, waste water for treatment, and manufacturing emissions.

Material Composition

The typical composition of an Ultra Spec® HP DTM Acrylic Enamels coating is shown by % mass in Table 2.

Table 2: Typical composition of Ultra Spec® HP DTM by % mass

Ingredient category	% of product by mass
Additive	2.9 – 19%
Antifoamer	0 – 1.1%
Biocide	0 – 0.69%
Nepheline	0 – 10.2%
Resin	34 – 75%
Solvent	0 – 1.2%
Surfactant	0 – 1.3%
Thickener	0 – 0.79%
Titanium dioxide	0 – 50%
Water	6.9 – 14%

Life Cycle Assessment Methodology

Functional Unit

Per PCR requirements, this EPD is based on a cradle-to-grave LCA. The functional unit for the study is defined as 1 m^2 of covered and protected substrate for a period of 60 years. The PCR requires results to be calculated for a market-based lifetime and a design lifetime for the coating product.

Market-Based Life Used in Assessment

The market-based lifetime for interior coatings is 5 years.

Design-Based Life Used in Assessment

The design-based lifetime is determined by durability testing, as show in Table 4**Error! Reference source not found.**. Paint is either low quality (3 year lifetime), medium quality (7 year lifetime) or high quality (15 year lifetime) based on these test results. The requirements for the durability testing were met through the testing for high performance MPI standards. The MPI scrub resistance and burnish resistance tests are based on the ASTM D2486 and ASTM D6736 standards, respectively, and follow methods of this standard that are more stringent than the ones specified by the PCR. The cleansabilty test is based on a more rigorous ASTM standard than the test specified by the PCR. If a test is not included in the MPI standard, it is because the test was not deemed relevant for that paint type, and does not need to be considered. Therefore, high performance MPI certifications can be considered high quality.

Each Ultra Spec HP DTM Acrylic Enamels product was subjected to these tests, or the relevant MPI testing. The corresponding quality levels and coating quantities were calculated for each product and can be found in Table 4.

Table 3: Required testing for design lifetime of interior coatings

Test Type	Test	Substrate	Low Quality	Mid Quality	High Quality	MPI Test
Scrub Resistance	ASTM D2486-06	Plastic	< 100 scrubs	100 – 400 scrubs	> 400 scrubs	**>4000 scrubs**
Burnish – 20 cycle	ASTM D6736-08	Plastic	Change in gloss > 20	Change in gloss	Change in gloss < 10	**Change in gloss <2**
Washability	ASTM D4828-94	Plastic	Avg. score < 3	Avg. score between 3	Avg. score > 7	

Table 4: Lifetime, reference flow, and quantity of colorant required

Product Number	Quality level	Design lifetime (years)	Market lifetime (years)	Design lifetime quantity (kg)	Market lifetime quantity (kg)	Colorant - Design lifetime (g)	Colorant - Market lifetime (g)
HP2508	High	15	5	0.285	0.854	-	-
HP251X	High	15	5	0.271	0.813	13.8	41.5
HP252X	High	15	5	0.253	0.758	20.0	60.1
HP253X	High	15	5	0.224	0.673	32.2	96.5
HP254X	High	15	5	0.410	1.23	72.0	216
HP2564	High	15	5	0.266	0.798	-	-
HP2582	High	15	5	0.254	0.761	-	-
HP2515	High	15	5	0.262	0.786	-	-
HP2521	High	15	5	0.253	0.760	-	-
HP2808	High	15	5	0.274	0.822	-	-
HP281X	High	15	5	0.263	0.790	13.8	41.5
HP282X	High	15	5	0.248	0.745	20.0	60.1
HP283X	High	15	5	0.222	0.667	32.2	96.5
HP284X	High	15	5	0.409	1.23	74.5	223
HP2821	High	15	5	0.245	0.735	-	-
HP2882	High	15	5	0.244	0.731	-	-
HP2908	High	15	5	0.286	0.857	-	-
HP291X	High	15	5	0.272	0.816	13.8	41.5
HP292X	High	15	5	0.249	0.748	20.0	60.1

HP293X	High	15	5	0.223	0.668	32.2	96.5
HP294X	High	15	5	0.419	1.26	74.7	224
HP2964	High	15	5	0.265	0.795	-	-
HP2982	High	15	5	0.251	0.752	-	-
HP2921	High	15	5	0.250	0.751	-	-
HP2915	High	15	5	0.259	0.776	-	-

Amount of Colorant Needed

Following the PCR, for any coating that can accept colorant, it was assumed that the full allowable amount of colorant is added to the paint either at the point of sale or application site. The tint/colorant inventory was taken from the GaBi carbon black pigment data in the appropriate quantity specified for the type of coating base for the respective Ultra Spec® HP DTM Acrylic Enamels products. The amount of colorant needed for each formula is shown in Table 4, and its impact is included in the overall LCA results.

Data Quality Assessment

Precision and Completeness

The majority of the relevant foreground data are measured or calculated based on primary data from the owner of the technology, so precision is considered high. Completeness of each foreground process is considered high as each process was checked for mass balance and completeness of the emission inventory. All background data are sourced from the GaBi 2016 databases with the documented precision and completeness.

Consistency and Reproducibility

To ensure data consistency, all primary data were collected with the same level of detail, while all background data were sourced from the GaBi 2016 databases. Reproducibility is supported as much as possible through the disclosure of input-output data, dataset choices, and modeling approaches.

Temporal Coverage

All primary data were collected for the fiscal year 2015. All secondary data come from the GaBi 2016 databases and are representative of the years 2010-2015. As the study intended to compare the product systems for the reference year 2015, temporal representativeness is considered to be high.

Geographic Coverage

All primary and secondary data were collected specific to the countries or regions under study. Where country-specific or region-specific data were unavailable, proxy data were used. Geographical representativeness is considered to be high.

Allocation

As stated in the reference PCR, allocation was avoided whenever possible. The only allocation used in the LCA model was volume-based allocation during the manufacturing process to assign Benjamin Moore manufacturing plant inputs and outputs across multiple paint products produced at the same plant.

System Boundary

As shown in Figure 1 the system boundary includes all life cycle stages as defined by ISO 21930, from raw material extraction and processing, coating manufacture, application and end-of-life treatment, with transportation included in all stages.

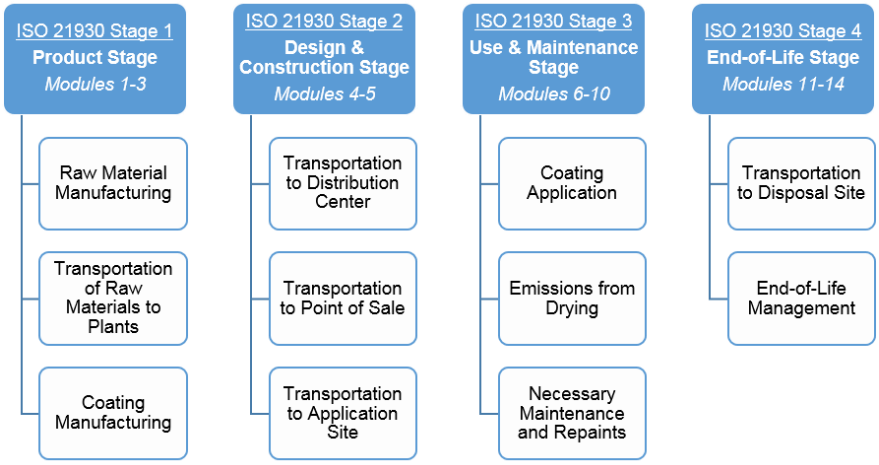

Figure 1: Life cycle stages included in system boundary

Cut-Off Criteria

No cut-off criteria were defined for this study. All relevant inputs were included in LCA models with the exception of:

- Personnel impacts;
- Research and development activities;
- Business travel;
- Any secondary or tertiary packaging (e.g., pallets);
- All point of sale infrastructure; and,
- The coating applicator.

Life Cycle Impact Assessment

Impact Assessment Categories

The Life Cycle Impact Assessment (LCIA) relates the life cycle inventory to the potential environmental impacts. The PCR requires that the following key parameters of environmental impact assessment be declared based on the EPA's TRACI methodology (v2.1), except in the case of global warming potential which must be declared based on the IPPC (AR5) methodology:

- Global warming potential (GWP) – 100 year (used in place of climate change)
- Acidification potential (AP)
- Ozone depletion potential (ODP)
- Smog formation potential (SFP) (used in place of photochemical ozone creation potential)
- Eutrophication (EP)

The PCR also requires that the following material and energy emissions and waste shall be calculated and declared:

- Depletion of non-renewable energy resources
- Depletion of non-renewable material resources
- Use of renewable primary energy
- Use of renewable material resources
- Consumption of freshwater
- Hazardous waste disposed

- Non-hazardous waste disposed
- Secondary fuels
- Non-renewable resources
- Renewable resources
- Recycled materials
- Secondary raw materials
- Water

Key Environmental Parameters

The LCIA results for the design lifetime and the market lifetime are shown in Table 5 and Table 6, respectively. A representative product was chosen based on the median of the five impact categories. Results for global warming potential for the entire product line and the representative product are shown in Figure 2. Results for this product grouped by life cycle stages prescribed by the PCR are presented in Figure 3. Results in **Error! Reference source not found.** are shown for market life, but the percent contribution for each stage for design life are essentially identical.

Table 5: LCIA results for design lifetime

Impact category	Global warming potential 100, excl biogenic carbon [kg CO_2-equiv.]	Acidification [kg SO_2-equiv.]	Eutrophication [kg N-equiv.]	Ozone depletion air [kg CFC 11-equiv.]	Smog air [kg O_3-equiv.]
HP2508	1.35E+00	2.39E-02	2.94E-04	1.13E-09	1.03E-01
HP251X	1.32E+00	2.29E-02	2.83E-04	1.08E-09	1.01E-01
HP252X	1.24E+00	1.73E-02	2.56E-04	1.04E-09	9.43E-02
HP253X	1.14E+00	9.19E-03	2.19E-04	9.73E-10	8.68E-02
HP254X	2.17E+00	6.24E-03	3.90E-04	1.81E-09	1.11E-01
HP2564	1.10E+00	1.77E-02	2.24E-04	1.21E-09	8.50E-02
HP2582	1.03E+00	1.45E-02	2.05E-04	1.20E-09	8.12E-02
HP2515	1.11E+00	1.96E-02	2.28E-04	1.21E-09	8.67E-02
HP2521	1.05E+00	1.51E-02	2.10E-04	1.21E-09	8.22E-02
HP2808	1.33E+00	2.24E-02	2.86E-04	1.13E-09	1.02E-01
HP281X	1.31E+00	2.30E-02	2.80E-04	1.08E-09	9.91E-02
HP282X	1.22E+00	1.86E-02	2.55E-04	1.04E-09	9.46E-02
HP283X	1.17E+00	1.00E-02	2.24E-04	9.75E-10	8.77E-02
HP284X	2.23E+00	6.47E-03	3.97E-04	1.87E-09	1.65E-01
HP2821	1.19E+00	3.38E-03	2.22E-04	1.10E-09	8.66E-02
HP2882	1.19E+00	3.39E-03	2.22E-04	1.10E-09	8.68E-02
HP2908	1.23E+00	2.54E-02	2.59E-04	1.22E-09	9.27E-02
HP291X	1.21E+00	2.51E-02	2.54E-04	1.17E-09	9.23E-02
HP292X	1.12E+00	1.84E-02	2.23E-04	1.13E-09	8.55E-02
HP293X	1.05E+00	1.14E-02	1.95E-04	1.06E-09	7.99E-02
HP294X	2.03E+00	1.19E-02	3.51E-04	2.04E-09	1.52E-01
HP2964	1.14E+00	1.99E-02	2.33E-04	1.21E-09	8.71E-02

HP2982	1.06E+00	1.48E-02	2.10E-04	1.21E-09	8.20E-02
HP2921	1.07E+00	1.49E-02	2.12E-04	1.21E-09	8.27E-02
HP2915	1.13E+00	2.02E-02	2.32E-04	1.22E-09	8.68E-02

Table 6: LCIA results for market lifetime

Impact category	Global warming potential 100, excl biogenic carbon [kg CO_2-equiv.]	Acidification [kg SO_2-equiv.]	Eutrophication [kg N-equiv.]	Ozone depletion air [kg CFC 11-equiv.]	Smog air [kg O_3-equiv.]
HP2508	4.05E+00	7.17E-02	8.81E-04	1.13E-09	3.08E-01
HP251X	3.97E+00	6.86E-02	8.50E-04	1.08E-09	3.02E-01
HP252X	3.72E+00	5.18E-02	7.67E-04	1.04E-09	2.83E-01
HP253X	3.43E+00	2.76E-02	6.57E-04	9.73E-10	2.60E-01
HP254X	6.52E+00	1.87E-02	1.17E-03	1.81E-09	3.34E-01
HP2564	3.31E+00	5.31E-02	6.71E-04	1.21E-09	2.55E-01
HP2582	3.09E+00	4.34E-02	6.16E-04	1.20E-09	2.44E-01
HP2515	3.32E+00	5.88E-02	6.83E-04	1.21E-09	2.60E-01
HP2521	3.16E+00	4.54E-02	6.31E-04	1.21E-09	2.47E-01
HP2808	3.99E+00	6.72E-02	8.57E-04	1.13E-09	3.05E-01
HP281X	3.93E+00	6.89E-02	8.40E-04	1.08E-09	2.97E-01
HP282X	3.67E+00	5.58E-02	7.65E-04	1.04E-09	2.84E-01
HP283X	3.50E+00	3.01E-02	6.71E-04	9.75E-10	2.63E-01
HP284X	6.68E+00	1.94E-02	1.19E-03	1.87E-09	4.94E-01
HP2821	3.56E+00	1.01E-02	6.67E-04	1.10E-09	2.60E-01
HP2882	3.56E+00	1.02E-02	6.66E-04	1.10E-09	2.60E-01
HP2908	3.68E+00	7.61E-02	7.78E-04	1.22E-09	2.78E-01
HP291X	3.64E+00	7.54E-02	7.61E-04	1.17E-09	2.77E-01
HP292X	3.36E+00	5.53E-02	6.70E-04	1.13E-09	2.57E-01
HP293X	3.16E+00	3.41E-02	5.85E-04	1.06E-09	2.40E-01
HP294X	6.08E+00	3.57E-02	1.05E-03	2.04E-09	4.55E-01
HP2964	3.41E+00	5.96E-02	6.99E-04	1.21E-09	2.61E-01
HP2982	3.17E+00	4.43E-02	6.29E-04	1.21E-09	2.46E-01
HP2921	3.21E+00	4.46E-02	6.36E-04	1.21E-09	2.48E-01
HP2915	3.38E+00	6.07E-02	6.96E-04	1.22E-09	2.60E-01

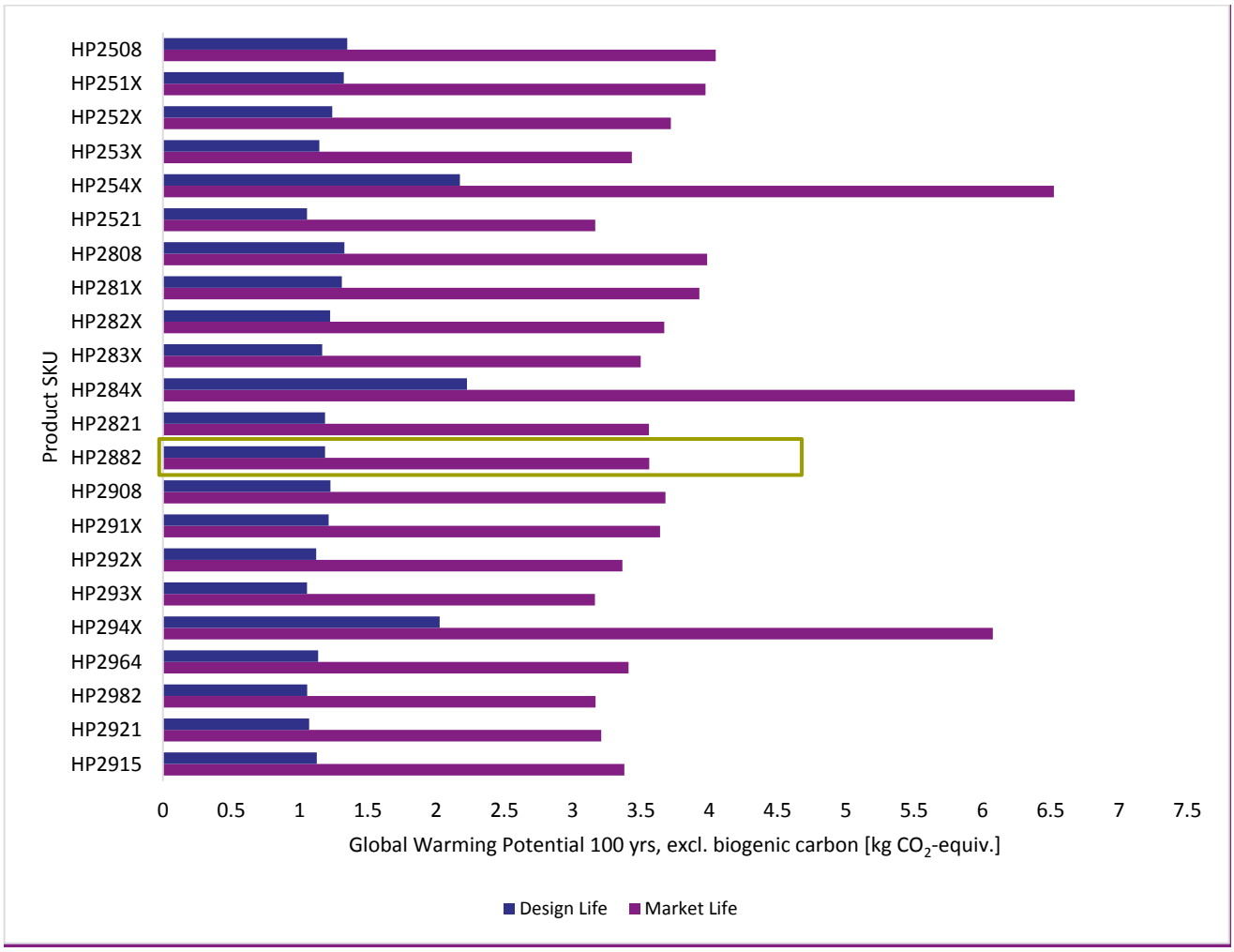

Figure 2: Global Warming Potential 100 yrs., excl biogenic carbon for product line, design and market life

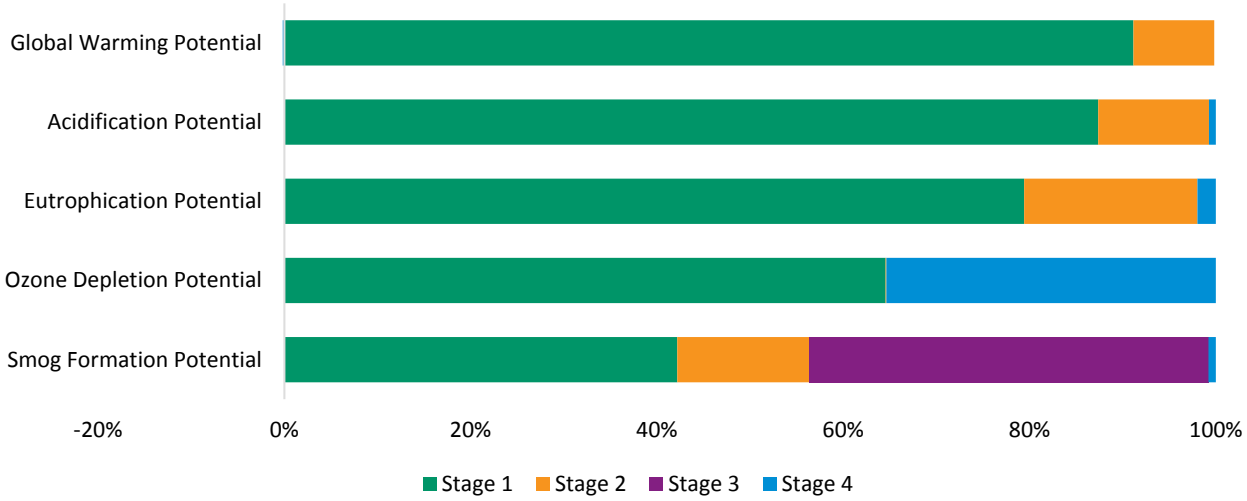

Figure 3: LCIA results by product stage for representative product, HP2882 (market life)

Additional Life Cycle Inventory Results

The additional inventory results required by the PCR for a representative product are shown in Table 7 and Table 8 for the design and market life, respectively.

Table 7: Additional LCI categories for the design life of HP2882

Additional LCI category	Total	Stage 1	Stage 2	Stage 3	Stage 4
Primary energy, non-renewable [MJ]	***2.61E+01***	***2.47E+01***	***1.40E+00***	***0.00E+00***	***3.24E-02***
Crude oil [MJ]	**7.11E+00**	5.79E+00	1.24E+00	0.00E+00	7.03E-02
Hard coal [MJ]	**1.42E+00**	1.54E+00	1.66E-02	0.00E+00	-6.85E-02
Natural gas [MJ]	**1.63E+01**	1.62E+01	1.26E-01	0.00E+00	4.16E-03
Lignite [MJ]	**4.67E-01**	4.57E-01	1.53E-03	0.00E+00	8.87E-03
Uranium [MJ]	**7.78E-01**	7.52E-01	8.14E-03	0.00E+00	1.76E-02
Primary energy, renewable [MJ]	***1.46E-04***	***1.44E-04***	***2.51E-06***	***0.00E+00***	***4.78E-07***
Geothermal [MJ]	**7.48E-01**	6.81E-01	4.97E-02	0.00E+00	1.69E-02
Hydro [MJ]	**1.63E-02**	1.59E-02	2.81E-04	0.00E+00	7.96E-05
Solar [MJ]	**1.63E-02**	1.59E-02	2.81E-04	0.00E+00	7.96E-05
Wind [MJ]	**1.37E-01**	1.28E-01	2.41E-03	0.00E+00	6.97E-03
Depletion of non-renewable material resources [kg]	***9.97E-01***	***9.75E-01***	***6.54E-03***	***0.00E+00***	***2.62E-02***
Use of renewable resources [kg]	***6.70E+00***	***6.64E+00***	***3.35E-02***	***0.00E+00***	***2.94E-02***
Air [kg]	**6.66E+00**	6.61E+00	2.42E-02	0.00E+00	2.65E-02
Carbon dioxide [kg]	**2.57E-02**	2.23E-02	2.79E-03	0.00E+00	5.96E-04
Nitrogen [kg]	**0.00E+00**	0.00E+00	6.65E-15	0.00E+00	-3.31E-09
Oxygen [kg]	**1.29E-02**	4.17E-03	6.46E-03	0.00E+00	2.31E-03
Primary forest [kg]	**7.30E-08**	7.02E-08	2.19E-15	0.00E+00	2.77E-09
Renewable fuels [kg]	**3.30E-08**	3.82E-07	0.00E+00	0.00E+00	0.00E+00
Recycled materials (kg)	**7.36E-03**	0.00E+00	0.00E+00	0.00E+00	7.36E-03
Secondary raw materials (kg)	**3.38E-04**	3.38E-04	0.00E+00	0.00E+00	0.00E+00
Hazardous waste [kg]	**2.33E-07**	1.44E-08	2.18E-07	0.00E+00	2.83E-10
Non-hazardous waste [kg]	**2.47E-01**	6.23E-03	1.02E-04	0.00E+00	2.41E-01
Blue water consumption [m^3]	**5.46E-03**	4.95E-03	5.13E-04	0.00E+00	-5.16E-06

Table 8: Additional LCI Categories for the market life of HP2882

Additional LCI category	Total	Stage 1	Stage 2	Stage 3	Stage 4
Primary energy, non-renewable [MJ]	***7.83E+01***	***7.41E+01***	***4.19E+00***	***0.00E+00***	***9.73E-02***
Crude oil [MJ]	**2.13E+01**	1.74E+01	3.73E+00	0.00E+00	2.11E-01
Hard coal [MJ]	**4.27E+00**	4.61E+00	4.97E-02	0.00E+00	-2.06E-01
Natural gas [MJ]	**4.89E+01**	4.85E+01	3.79E-01	0.00E+00	1.25E-02
Lignite [MJ]	**1.40E+00**	1.37E+00	4.58E-03	0.00E+00	2.66E-02
Uranium [MJ]	**2.33E+00**	2.26E+00	2.44E-02	0.00E+00	5.28E-02
Primary energy, renewable [MJ]	***2.24E+00***	***2.04E+00***	***1.49E-01***	***0.00E+00***	***5.07E-02***
Geothermal [MJ]	**4.89E-02**	4.78E-02	8.42E-04	0.00E+00	2.39E-04

Hydro [MJ]	**4.89E-02**	4.78E-02	8.42E-04	0.00E+00	2.39E-04
Solar [MJ]	**4.11E-01**	3.83E-01	7.22E-03	0.00E+00	2.09E-02
Wind [MJ]	**1.19E+00**	1.03E+00	1.37E-01	0.00E+00	2.25E-02
Depletion of non-renewable material resources [kg]	***2.99E+00***	***2.92E+00***	***1.96E-02***	***0.00E+00***	***7.87E-02***
Use of renewable resources [kg]	***2.01E+01***	***1.99E+01***	***1.00E-01***	***0.00E+00***	***8.83E-02***
Air [kg]	**2.99E+00**	1.98E+01	7.27E-02	0.00E+00	7.96E-02
Carbon dioxide [kg]	**2.01E+01**	6.70E-02	8.37E-03	0.00E+00	1.79E-03
Nitrogen [kg]	**2.00E+01**	0.00E+00	2.00E-14	0.00E+00	-9.93E-09
Oxygen [kg]	**7.71E-02**	1.25E-02	1.94E-02	0.00E+00	6.92E-03
Primary forest [kg]	**0.00E+00**	2.11E-07	6.58E-15	0.00E+00	8.30E-09
Renewable fuels [kg]	**3.88E-02**	1.15E-06	0.00E+00	0.00E+00	0.00E+00
Recycled materials (kg)	**2.21E-02**	0.00E+00	0.00E+00	0.00E+00	2.21E-02
Secondary raw materials (kg)	**1.01E-03**	1.01E-03	0.00E+00	0.00E+00	0.00E+00
Hazardous waste [kg]	**6.98E-07**	4.32E-08	6.54E-07	0.00E+00	8.50E-10
Non-hazardous waste [kg]	**7.41E-01**	1.87E-02	3.07E-04	0.00E+00	7.22E-01
Blue water consumption [m^3]	**1.64E-02**	1.48E-02	1.54E-03	0.00E+00	-1.55E-05

Emissions to Water, Soil, and to Indoor Air

Because coatings are a passive product during use, the only impacts occurring during this stage are generally due to the off-gassing of material components in the paint. The quantity of VOC emissions during the use stage for Ultra Spec® HP DTM Acrylic Enamels products are assumed to equal the EPA Method 24 listed VOC contents on the label.

LCA Interpretation

For all Ultra Spec® HP DTM Acrylic Enamels, raw materials and manufacturing are the highest contributors to most impact categories. The only exception to this is smog formation potential, which is dominated by both paint production (Stage 1) and by VOC emissions during use (Stage 3). The raw materials burden is dominated by the pigments and acrylic resin, which follows as they are often the highest percent by weight in the paint composition. Additionally, the energy demand for producing titanium dioxide (a pigment) is relatively high. Acidification potential in particular is dominated by the titanium dioxide production. Packaging and use are low for all impact categories with the exception of the use stage's contribution to smog formation potential. The relatively high ozone depletion in the end of life are due the energy required to recycle packaging materials at end of life. Transportation is small but significant for global warming potential.

Additional Environmental Information

Environmental Certifications

COLLABORATIVE FOR HIGH PERFORMANCE SCHOOLS. CHPS

Certified (low emitting materials category)

Ultra Spec® HP DTM Acrylic Enamels are Collaborative for High Performance Schools (CHPS) and California Department of Health Environmental Health Laboratory (CDPH/EHLB) standard method V1.1 emission certified.

LEED® v4 Low Emitting Product Credit, Building Product Disclosure Credit

(when used for Industrial maintenance applications).

Preferred End-of Life Options

Please visit www.paintcare.org for information about disposing unused acrylic enamel paint. If possible, unused paint should be taken to an appropriate recycling/take-back center or disposed of in accordance with local environmental regulatory agency guidance.

References

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

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