

HP Latex R Series Inks print durability

Regulatory compliance, and environmental attributes





The design of wide-format applications requires a good understanding of substrate options, printer and ink capabilities, as well as finishing and display techniques.

One key aspect to be considered is the durability of the prints... How long will they last?

Will they resist the “wear and tear” to which the application will be subjected?

Is lamination required, or will the application be robust enough without lamination?

Of course, wide-format prints are used for an extremely wide range of applications and the sources of potential damage can vary significantly between applications. Vehicle graphics, for example, may be exposed for many months in outdoor locations, and will be subjected to the damaging UV rays in sunlight, regular washing, and occasional vehicle fuel spills—durability requirements in this case are very high.

At the other extreme, some event graphics and signs may only be required for a few days. Durability requirements in this case are relatively low—in fact, the question in this case is whether lamination is required at all.

This guide provides:

- An understanding of the different components of durability, and which components should be considered in different environments
- Results from tests conducted on prints produced with HP Latex R series Inks for each of these different components
- Recommendations to print service providers (PSPs) when producing wide-format applications with HP Latex R series Inks
- Details of application warranties available from media manufacturer

Join the community, find tools and talk to experts. Visit the HP Latex Knowledge Center at hp.com/communities/HPLatex

The components of “durability”

Durability is the ability to withstand “wear and tear” from the different sources of potential damage to which wide-format prints may be exposed.

These components can be grouped as follows:



Light-Fade resistance



Scratch and abrasion resistance



Water and chemical resistance

Light-Fade resistance

Light-fade resistance, sometimes referred to as print permanence, is a measure of how well a print resists fading with exposure to light and other environmental factors such as ozone. The color of an ink comes from its dyes or pigments, and over time these particles will be broken down by UV rays in sunlight, resulting in colors that fade. Prints produced with inks that contain pigments, such as HP Latex Inks, tend to last longer than prints produced with inks that contain dyes, but nonetheless they will start to fade over time depending on the intensity of UV light exposure.

Since the amount of UV light varies greatly between different locations, HP tests light-fade resistance in three different conditions which represent typical display locations for wide-format graphics:



Outdoor display

Test conditions are representative of signs, banners, and other outdoor applications that are subjected to direct sunlight and rain. The testing environment takes into consideration the worst case of direct and indirect sunlight conditions as well as excessive humidity environments which have an aggressive effect on substrates¹.



Indoor in-window display

Test conditions are representative of prints displayed in a window receiving partial or direct sunlight, for example signage in a retail store window which faces directly onto an outside street².



Indoor away from direct sunlight

Test conditions are representative of prints installed indoor and away from direct sunlight. A typical application example is a photo or canvas print, installed under common indoor lighting and environmental conditions.

¹ Display permanence is tested according to SAE J2527 in a vertical display orientation in simulated nominal outdoor display conditions for select high and low climates, including exposure to direct sunlight and water. The HP Image Permanence Lab complements lab testing with field testing, placing print samples in real-life conditions at multiple test sites to account for a range of environmental conditions.

² HP in-window test data is generated using Xenon-Arc illuminant and assumes 6,000 Lux/12 hr day.

HP Latex R series Inks: Light-fade resistance

This table shows the expected life of prints produced with HP Latex R series Inks on different media types and in different display environments based on internal testing by the HP Image Permanence Lab:

Light-fade resistance	Outdoor ¹ , no lamination	Outdoor ¹ , with lamination (film)	Indoor in window ² , no lamination	Indoor away from direct sunlight, no lamination
Self-adhesive vinyl	up to 4 yrs	up to 6 yrs	up to 6 yrs	up to 130 yrs
Acrylic (Plexiglass)	up to 2,5 yrs	-	up to 3,5 yrs	up to 98 yrs
Polycarbonate	up to 2,5 yrs	-	up to 3 yrs	up to 103 yrs
Aluminum composite (Dibond)	up to 4,5 yrs	-	up to 7 yrs	up to 148 yrs
Fluted Polypropylene (PP)	up to 2 yrs	-	-	-

These results are a summary of testing done across HP Latex R series Inks (HP 872,882, 886 Inks), on a range of HP and third-party media. Performance may vary as environmental conditions change and results may vary based on specific media performance. Specific test results for the HP large format printing materials portfolio can be viewed at globalBMG.com/hp/printpermanence

Note that these results are provided as guidance only. Due to the very high number of media available in the market as well as the number of external factors involved in any application, HP is not able to offer a warranty on light-fade durations. Refer to the “Application warranties” section in this document for warranties from media manufacturers.

Scratch and abrasion resistance

Scratch resistance and abrasion resistance refer to the ability of a print to resist damage from different objects with which it comes into contact. This is a relevant consideration during the finishing, shipping, and installation of a graphic, as well as once it is in its final display position.

Scratch damage refers specifically to damage from sharp or pointed objects—fingernails, for example. This is a very important consideration for high-value prints that will be viewed at short distance, since a single scratch can occur in an instant and permanently damage a print.

Abrasion (also called dry rub) refers to damage caused by repeated rubbing in the same location. This is an important consideration for mid-to long-term graphics that will be exposed to repeated rubbing or scuffing in the same location. For example, graphics applied to the doors of buildings or vehicles will require high abrasion resistance due to repeated touching and pushing around areas with handles.

HP tests scratch and abrasion resistance using a Taber tester (Figure 1) and according to industry standard test methods.³



Figure 1
Scratch and abrasion testing are performed using a Taber tester, according to industry-standard test methods.³

³ Scratch resistance is measured according to test method ISO 1518-2:2011. Abrasion resistance is tested according to ASTM F1571-95 (2008).

Water and chemical resistance

Water resistance and chemical resistance refer to the ability of a graphic to resist water, cleaning products, and other chemicals with which it may come into contact. For example, graphics in some indoor locations may be occasionally cleaned with water and indoor detergents. Vehicle graphics may come into contact with vehicle fuels, especially in the area of the fuel filling cap.

To test performance in this area, HP performs wet rub testing with water, as well as three common cleaning and chemical products—Windex® window cleaner, ethanol, and isopropyl alcohol.

HP Latex R series Inks: Scratch, abrasion, water and chemical resistance

Flexible Media	(Self-Adhesive Vinyl, Banner)
Scratch ⁴	High
Water Rub ⁶	High
Abrasion (dry rub) ⁵	Medium
Windex Window Cleaner	Medium
Isopropyl alcohol	Low

Rigid Media	Foam PVC, Fluted PP, Foamboard	ACP, Acrylic, PC
Chipping Resistance	High	High
Ink elasticity (stretch)	High	High
Ink Adhesion (Tape test)	High	High
Scratch (dry)	High	Medium *
Abrasion (dry rub)	Medium	Medium
Water Rub ⁶	Medium	Medium
Windex Window cleaner	Medium	Medium
Wet Scratch ⁵	Medium	Low (ACP/Acrylic) / High (PC) **
Isopropyl Alcohol	Low	Low



Scratch resistance



Abrasion resistance



Water and chemical resistance

* Samples may require protection when transported. Follow handling tips and tricks recommendation.

** Results on Polycarbonate are slightly better than the rest of rigid substrates.

⁴Wet rub resistance is measured according to the test method ASTM F1571-95(2008)

⁵Wet scratch resistance is measured by applying some water directly to the printed surface and after 10sec scratching with the fingernail.

⁶Performance against water scratch resistance varies across media composition. Table represents the most common behaviour. For further info refer to media locator for specific brands.

Lamination techniques

Lamination is a finishing technique in which a transparent film or clear coat is applied on top of a printed graphic.

Two main techniques exist—film lamination and liquid (clear coat) lamination.

Reasons for laminating include:

- to increase the durability of the print
- to modify its appearance, such as a gloss or matte finish
- to increase the rigidity of a print, which makes the installation easier on large surfaces

Film lamination is the most common technique used—it provides a high level of protection and the equipment required is relatively simple and affordable. Correctly applied, film lamination can provide long-term protection from scratches and abrasion as well as from water and common chemicals. If the film lamination includes a UV filter, it can also increase the light-fade resistance of the graphic.

Liquid (clear coat) lamination may be used for flexible substrates such as canvas and PVC banner, where film lamination is not a practical solution. Liquid lamination is also used by high-volume vehicle fleet graphics specialist companies who require a more economical solution than film lamination. Liquid lamination is more complex to apply than film lamination since it requires specialist equipment to provide an even, consistent layer. Liquid lamination provides the graphic with additional protection, however not to the level of film lamination.

Due to the wide variety of lamination products available, customers should refer to the media manufacturer for suitable lamination recommendations.

Lamination recommendations

There are no hard-and-fast rules about when lamination should be used, but by understanding the different durability attributes of prints produced with HP Latex Inks, you can be in the best position to design and build appropriate graphics and applications.

General recommendations with HP 872, 882, 886 Latex Inks:

Duration	Recommendations
Short-term applications (< 1 month)	Indoor and Outdoor applications: Lamination is typically not required for indoor or outdoor applications when these applications are for short term use at exhibitions, events, etc. *
Mid-term applications (1-6 months)	Indoor applications: Lamination is <u>not</u> normally required for indoor applications, unless they are installed in high traffic areas or exposed to continuous damage caused by abrasion, water, soiling or other risks*. Outdoor applications: Lamination is usually recommended for outdoor applications*.
Long-term applications (> 6 months)	Indoor applications: Lamination is not normally required for indoor applications* Outdoor applications: Lamination is strongly recommended for all durable outdoor applications lasting more than 6 months.

*Lamination is recommended on all applications that are subject to mechanical abrasion or scratching. e.g., signs installed in aggressive environmental conditions, that require resistance to chemicals or special features such as anti-slip properties or anti-graffiti coatings. Lamination is also highly recommended, if the application is installed in high traffic areas, where exposed to continuous damage caused by abrasion, water, soiling, or other risks.

HP Latex Inks durability with textiles

PSPs have numerous technology options for printing textiles, including dye-sublimation technology, UV-curable ink technology, as well as HP Latex Technology.

Dye sublimation is a dedicated textile technology. It provides durable results; however, dye-sublimation printers can only be used for printing textiles with an additional investment in a calender or heat press. The dye sublimation printing process demands a high level of expertise and requires good climate control for consistent results.

Textiles printed with HP Latex Technology do not generally have the same overall durability as textiles printed with dye-sublimation. However, there are advantages to using HP Latex Technology:

- An easy-to-use alternative to dye sublimation, with no additional investment required in a calender
- Ability to print on a wider range of textiles: coated and uncoated textiles, polyester-based textiles, as well as natural fibers such as cotton or linen.⁷

HP Latex Technology is suitable for:

- Short-term, single-use event signs and graphics... “temporary textiles”⁷
- Canvas

HP Latex Technology is generally not suitable for:

- Long-term, multi-use applications that will be subjected to repeated handling and folding
- Garments and clothing, and other applications that require washing
- Flags requiring bleed-through
- Stretch textiles (> 5% stretch)

If in doubt about suitability for a specific application, customers should test first. Customers are recommended to roll and not fold textiles printed with HP Latex Inks to avoid crease lines and marks.

⁷ Performance may vary depending on media—for more information, see hp.com/go/mediasolutionslocator or consult your media supplier for compatibility details. For best results, use textiles that do not stretch. Performance varies by printer. For HP Latex R series printers, print on media that does not let the ink trespass onto the printer.



Dye sublimation is a two-step process requires
a specialized textile calender



HP Latex single-step process

Find a comprehensive list of all latex compatible media along with finished color profiles and printing settings at hp.com/go/mediasolutionslocator

For more information on applications: detailed how-to, tips & tricks and latex users forums, visit the Latex knowledge center at hplatexknowledgecenter.com

Summary of Regulatory Compliance and Environmental Attributes

HP R Series Latex Inks are aqueous-based ink formulations designed by HP to meet worldwide regulatory requirements and to address a broad range of health and environmental considerations throughout the entire life cycle of a print from production to disposal.

Chemical Inventory Status

The following countries have chemical inventory requirements, and the HP R Series Latex Inks can be imported without restriction:

- Australia (AICS)
- Canada (NDSL and DSL)
- China (IECSC)
- Province of Ontario
- Japan (ENCS)
- Korea (KECI, K-REACH)
- New Zealand (NZIoC)
- Switzerland (ChemO)
- Taiwan (ECSI, Taiwan REACH)
- United States (TSCA)

For EU REACH, HP has completed all necessary registrations to import the HP R Series Latex Inks.

Regulated Materials

HP R Series Latex Inks **DO NOT** contain the following regulated materials:

- Arsenic¹, antimony, soluble barium, cadmium, chromium, cobalt, mercury, lead, nickel, unbound copper², and selenium as intentionally added ingredients
- Restricted azo colorants
- Substances regulated as drugs and drug precursors or those requiring special permits for use
- Substances currently regulated under Annex XIV of EU REACH (authorisations) or substances currently restricted under Annex XVII of EU REACH (restrictions)

¹ EU Directive 2002/61/EC, additionally referenced as Regulation (EC) No 1907/2006: REACH, Annex XVI (article 67), restricts the use of azo colorants that break down to aromatic amines known to cause cancer.

² Copper is in the cyan pigment in the bound form

Health and Environmental Performance

Emissions

These inks do not contain Hazardous Air Pollutants (HAPs)³.

Volatile Organic Content (VOC) content for HP R Series Latex Inks is <300 gram/litre (by EPA Method 24). VOC emissions are very low, for example when compared to typical offset lithography emissions. Additional emissions data, generated in accordance with EPA Method 25, is available upon request. Cleaning and maintenance procedures are designed for minimal VOC emissions and comply with regulations in the United States.

³ HP R Series Latex Inks were tested for Hazardous Air Pollutants, as defined in the Clean Air Act, per U.S. Environmental Protection Agency Method 311 (testing conducted in 2013) and none were detected.

Human and Ecological Health

HP R Series Latex Inks are considered non-hazardous according to the Globally Harmonized System of Classification and Labelling of Chemicals (GHS, as implemented by the EU Classification, Labelling and Packing Regulation No 1272/2008/EC (CLP)), US HazCom 2012, and other country-specific GHS regulations.

HP R Series Latex Inks do not contain intentionally added components in the following categories:

- Carcinogens and mutagens;
- California Proposition 65 listed chemicals at concentrations requiring labelling;
- Intentionally added substances identified as endocrine disruptors;

- Substances classified as respiratory sensitizers;
- Substances considered very toxic or toxic;
- Substances identified as "very high concern" (SVHC) according to EU REACH criteria; and
- Substances identified as "very persistent and/or very bio accumulative" (VPVB) according to EU REACH criteria.

Transportation and Waste

HP R Series Latex Inks are non-flammable, non-combustible⁴, and do not require special handling, storage, or transportation-related conditions. These formulations are not classified as Dangerous Goods in accordance with international modes of transport (IATA, IMDG, U.S. DOT, and/or ADR) and do not contain listed marine pollutants. HP R Series Latex Inks do not contain the following substances and/or characteristics associated with hazardous waste:

- Regulated Metals
- Regulated Organics⁵
- Human health and/or ecological toxicity characteristics impacting waste profile

⁴ HP R Series Latex Inks not classified as flammable or combustible liquids under the USDOT or international transportation regulations. Testing per the Pensky-Martins Closed Cup method demonstrated flash point greater than 110° C.

⁵ According to California regulated organics list for hazardous waste, California Code of Regulations, Title 22, Chapter 11, Article 3.

Certifications

HP R Series Latex Inks have qualified for certifications that demonstrate they meet some of the most rigorous and comprehensive indoor air quality standards for low chemical emissions. Latex Inks allow HP customers to produce odourless prints.



UL ECOLOGO® Certified HP R Series Latex Inks meet a range of stringent human health criteria.⁵ In addition, HP R Series Latex Inks meet the criteria and certified for UL GreenGuard Gold.

Wall decorations printed with HP Latex Inks and HP PVC-free Wallpaper are rated A+ according to Émissions dans l'air intérieur.

The ZDHC Roadmap to Zero Level 1⁶ demonstrates that HP R Latex ink series conform to or meet the standards of the ZDHC Manufacturing Restricted Substances List (ZDHC MRSL) version 1.1.

⁵ UL ECOLOGO® Certification to UL 2801 demonstrates that an ink meets a range of stringent criteria related to human health and environmental considerations (see ul.com/EL).

⁶ ZDHC is an organization dedicated to eliminating hazardous chemicals and implementing sustainable chemicals in the leather, textile, and synthetics sectors. The Roadmap to Zero Program is a multi-stakeholder organization which includes brands, value chain affiliates, and associates, that work collaboratively to implement responsible chemical management practices.

Recyclability

HP R Series Latex printheads can be recycled through the HP Planet Partners Program.⁷ HP 872, HP 882, and HP 886 R Series Latex Inks are supplied in 3, 5, or 10-liter ink bag-in-a box supplies, where approximately 70% of the weight of the used ink cartridge is a recyclable cardboard container.

HP's recycling program, HP Planet Partners, allows easy recycling of HP 872, HP 882, and HP 886 ink printheads for free. Since the program began in 1991, customers have returned more than 500 million HP ink and LaserJet cartridges for recycling worldwide. HP's multi-phase "closed loop" recycling process uses cartridges returned through HP Planet Partners as raw material to produce new Original HP ink and LaserJet cartridges. For more information visit the HP Supplies Recycling page:

hp.com/recycle

⁷Visit hp.com/recycle to see how to participate and for HP Planet Partners Program availability; program may not be available in your area. For countries where this program is not available, and for other consumables not included in the program, consult your local waste authorities on appropriate disposal.

HP Design for Environment (DfE) Program

In 1992, HP adopted a pioneering company-wide Design for the Environment program that considers environmental impact in the design of every product and solution, from the small ink cartridges to large scale industrial presses.

For more information about HP's social and environmental responsibility programs, see www.hp.com.

Application warranties

All media manufacturers provide a basic product warranty to cover manufacturing defects such as visual defects or adhesive failure, for example.

3M and Avery Dennison go beyond this basic product warranty and provide application warranties for customers using their products in conjunction with HP Latex printers.

- 3M Performance Guarantee
- 3M™ Matched Component System (MCS™) Warranty
- Avery Integrated Component System (ICS) Performance Guarantee

3M Performance Guarantee

This warranty covers replacement or credit of the 3M products in case of physical defects, printing defects, cutting defects, and graphic appearance defects.

HP Latex R series printers and R series Inks (HP 872, 882 & 886 Latex Inks) are covered by the 3M Performance Guarantee.

The duration of the warranty period depends on the combination of 3M film used, overlamine, ink system, as well as the display conditions (vehicle, outdoor, watercraft, indoor). 3M publishes warranty matrices where the duration for each combination can be checked.

For complete information on the 3M Performance Guarantee terms and conditions, as well as warranty matrices, refer to the 3M documentation available at 3Mgraphics.com (choose your country for more specific warranty information) or consult your local 3M representative.

3M™ Matched Component System (MCS™) Warranty

The 3M™ MCS™ Warranty is available to certified graphics manufacturers (including PSPs). It goes beyond the 3M Performance Guarantee, and covers credit or replacement of all 3M products used in the graphic in case of physical defects, printing defects, cutting defects, graphic appearance defects, as well as ink performance related issues like excessive image fading, image cracking or crazing, image peeling, and gloss changes. Certain fleet and vehicle graphics may also have a labor reimbursement component.

HP 872, 882 & 886 Latex Inks for the HP Latex R series printers are covered by the 3M™ MCS™ Warranty

Avery Integrated Component System (ICS) Performance Guarantee

This warranty is written assurance from Avery Dennison that their products perform as expected from production through application and for the life of the graphic.

HP R series printers and R series Inks (HP 872, 882 & 886 Latex Inks) are covered by the Avery ICS Performance Guarantee.

The duration of the warranty period depends on the combination of Avery Dennison film used, overlamine, ink system, as well as the display conditions (outdoor, vehicle, marine, other). Avery Dennison publishes warranty matrices where the duration for each combination can be checked.

For complete information on the Avery ICS Performance Guarantee terms and conditions, as well as warranty matrices, refer to the Avery Dennison documentation available at averydennison.com (choose your country for more specific warranty information) or consult your local Avery Dennison representative.



Learn more at hp.com/go/latex

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