HP Latex Inks and Prints durability

| HP 872, 882 and 886 inks
| HP 832 and 873 inks
| HP 883 inks
| HP Latex R series
| HP Latex 630/700/800 series
| HP Latex 2700 series

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Introduction

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?

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Introduction

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 extremely 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 the HP Latex R series (with HP 872, 882 and 886 Latex inks), HP Latex 630, 700 and 800 series (with HP 832 and 873 Latex inks) and HP Latex 2700 series (with HP 883 Latex inks), for each of these different components.
- Recommendations for print service providers (PSPs) when producing wide-format applications with HP Latex R series, HP Latex 630, 700 and 800 series and HP Latex 2700 series Inks.
- Details of application warranties available from substrate manufacturers.
- Related sustainability certification for wallpaper applications, and a link to learn more details.

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

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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

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 the 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:

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The outdoor display

Test conditions are representative of signs, banners, and other outdoor applications that are subjected to direct sunlight and rain. This testing environment takes into consideration the worst-case scenario of direct and indirect sunlight conditions as well as excessive humidity environments which have an aggressive effect on substrates[1].

The 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 street[2].

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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[3].

[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.
[3] HP indoor lightfastness tests follow the ANSI/ISO IT9.9-1996 standard for an indoor "benchmark" condition of 12 hrs/day at 450 lux illumination with cool white fluorescent light.

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Table 1 shows the expected life of prints produced with HP Latex R series, HP Latex 630, 700 and 800 series and HP Latex 2700 series Inks on different substrate types and in different display environments based on internal testing by the HP Image Permanence Lab, and with the print modes offered in the published generic and the specific profiles:

Light-fade resistance	Outdoor, no lamination	Outdoor, with lamination (film)	Indoor in-window, no lamination	Indoor away from direct sunlight, no lamination
Self-adhesive vinyl (SAV)	Up to 4 y	Up to 6 y	Up to 6 y	Up to 130 y
Clear SAV with White Ink	Up to 4 y	Up to 6 y	Up to 3 y	> 60y
PVC Banner	Up to 4 y	n/a	Up to 3 y	> 60y
Poster Paper	n/a	n/a	Up to 1.5 y	> 60y
PET Film Clear[5] with White Ink	n/a	n/a	Up to 2 y	> 60y
Wallpaper	n/a	n/a	Up to 2 y	> 60y
Canvas	n/a	n/a	Up to 2 y	> 60y
Textiles	n/a	n/a	Up to 5 y	> 60y

Table 1. Light-fade resistance of flexible substrates

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Light-fade resistance	Outdoor, no lamination	Outdoor, with lamination (film)	Indoor in-window, no lamination	Indoor awayfrom direct sunlight, no lamination
Acrylic (Plexiglass)	Up to 2.5y	n/a	Up to 3.5 y	Up to 98 y
Polycarbonate	Up to 2.5 y	n/a	Up to 3 y	Up to 103 y
Aluminum composite (Dibond)	Up to 4.5 y	n/a	Up to 7 y	Up to 148 y
Fluted Polypropylene (PP)	Up to 2 y	n/a	n/a	n/a

Table 2. Light-fade resistance of rigid substrates

These results are a summary of testing done across HP Latex R series, HP Latex 630, 700 and 800 series and HP Latex 2700 series Inks, on a range of HP and third-party substrates. Performance may vary as environmental conditions change and results may vary based on specific substrate performance.

Note that these results are provided only as a guidance. Due to the extremely high number of substrates 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 substrate manufacturers.

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Scratch and abrasion resistance

Scratch resistance and abrasion resistance refer to the ability of a print to resist damage from different objects which it comes into contact with. 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 an especially important consideration for high-value prints that will be viewed at short distances 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.

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

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

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Water and chemical resistance

Water and chemical resistance refer to the ability of a graphic to resist water, cleaning products, and other chemicals which it may come into contact with. For example, graphics in some indoor locations may be cleaned with water and other detergents, and vehicle graphics undergo washings or sporadic fuel spills.

To test performance in this area, HP performs wet rub testing with water, as well as the common cleaning product– Windex® window cleaner.

Flexible substrates	Scratch[4]	Water Rub[5]	Abrasion (dry rub)[6]	Windex Window Cleaner[7]
Self-adhesive vinyl (SAV)	High	High	Medium	Medium
Clear SAV with White Ink	High	High	Medium	Medium
PVC Banner	High	High	Medium	Medium
PET Film Clear[8] with White Ink	High	High	Medium	Medium
Wallpaper	High	High	Medium	Medium
Canvas	High	Medium	Medium	n/a
Textiles	Medium	n/a	Medium	n/a

Table 3. Water and chemical resistance of HP Latex R series, HP Latex 630, 700 and 800 series and HP Latex 2700 series Inks.

[4] Scratch resistance is measured according to test method ISO 1518-2:2011.
[5] Wet rub is tested according to ISO 105-X12.
[6] Dry rub is tested according to ISO 105-X12 for textiles and papers; an internal method based on ISO 105-X12 and using a CS-10 abrader is used for the rest of the substrate types.
[7] Windex window cleaner resistance is tested according to ISO 105-X12.
[8] PET film clear refers to solvent based films. UV-coated PET films are not included in this test.

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Rigid substrates	Foam PVC, Fluted PP and Foamboards	ACP, Acrylic and PC
Chipping resistance	High	High
Bending (Ink elasticity, stretch)	High	High
Scratch (dry)	High	Medium[9]
Abrasion (Dry rub)	Medium	Medium
Water rub	Medium	Medium
Windex window cleaner	Medium	Medium
Wet scratch	Medium	Low (ACP/Acrylic) High (PC)[10]
Isopropyl Alcohol	Low	Low

Table 4. Water and chemical resistance of HP Latex R series Inks.

The rating shown in these tables is based on the average results of all the materials tested by HP, therefore, it shows the most common behaviors. Performance may vary depending on the substrate. Find the substrates that best perform with HP Latex R series, HP Latex 630, 700 and 800 series and HP Latex 2700 series in the HP PrintOS Media Locator.

Tests have been done using HP Latex Overcoat, the new component that works as the anti-scratch agent in HP 881 Latex Inks and provides a smooth, scratch-resistant layer.

[9] Samples may require protection when transported. Follow handling tips and tricks recommendation.
[10] Results on Polycarbonate are slightly better than the rest of rigid substrates.

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Water and chemical resistance

Graphics installed on offices or retail shops may undergo cleaning routines. For long-term applications or when harsh cleaning conditions occur, it will be required to protect the graphics with film or liquid lamination.

Graphics printed with the HP Latex R series, HP Latex 630, 700 and 800 series and HP Latex 2700 series can withstand a certain level of cleaning without lamination following these recommendations:

- Use water or a mild soap solution.
- Limit the use of alcohol-based cleaners; they can wipe the ink off after repeated cleaning routines.
- Wipe gently with a soft cloth.
- When spraying the surface, wipe immediately.
- In case disinfectants are required, chlorine bleach (0.1%) or hydrogen peroxide (0.5%) are recommended, used as described above.

HP Latex Inks and Prints durability

The components of durability

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 to laminate include:

- to increase the durability of the print,
- to modify its appearance, such as to give it a gloss or matte finish.
- to increase the rigidity of a print, which makes 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.

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Liquid (clear coat) lamination

may be used for flexible substrates such as canvas and PVC banners, 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, but not to the level of film lamination, however.

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

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Lamination recommendations

There are no fixed 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, 832, 873 and 883 Latex Inks:

Duration	Recommendations
Short-term applications (<1 month)	Lamination not typically required unless harsh conditions are expected.
Mid-term applications (1-6 months)	Lamination recommended, especially if graphics are expected to receive repeated rubbing or scuffing (e.g., graphics on doors and near handles).
Long-term applications (> 6 months)	Lamination strongly recommended, especially for outdoor applications.

Lamination is recommended in the following situations:

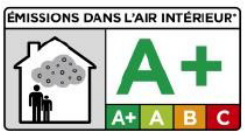
- when graphics are subjected to mechanical abrasion or scratching, such in high-traffic areas.
- when graphics require resistance to chemicals.
- when specific features, such as anti-slip or anti-graffiti properties, are needed.

Film lamination can be done immediately after printing. To obtain a better laminate adhesion, use print modes without overcoat.

HP Latex ink durability with wallcoverings

Health and environmental performance

HP 872, 882, 886, 832, 873 and 883 Latex Inks have qualified for certifications that demonstrate that they meet some of the most rigorous and comprehensive indoor air quality standards for low chemical emissions. Latex Inks allow HP customers to produce odorless prints.



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.

In addition, prints produced using HP Latex Inks on HP PVC-free Wallpaper meet AgBB criteria for health-related evaluations of VOC emissions of indoor building products. These prints are rated A+ (very low emission) according to the "Émissions dans l'air intérieur" statement on the level of volatile substances in indoor air.

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

- Colorfastness to light is measured in accordance with Fed. Std. No 191, Method 5660.1. The requirement for Category V, Type II is no less than 200h. 14 Applicable to HP Latex Inks. UL GREENGUARD Gold Certification of UL 2818 demonstrates that products are certified to UL GREENGUARD's standards for low chemical emissions into indoor air during product usage. HP Latex Inks are Unrestricted for a fully decorated room size of 33.4 m2 (360 ft2) in an office environment, 94.6 m2(1,018 ft2) in a classroom environment. For more information, visit ul.com/gg or greenguard.org.
- Émissions dans l'air intérieur provides a statement on the level of emission of volatile substances in indoor air posing health risks if inhaled—on a scale from A+ (very low-emission) to C (high-emission). Wall decorations printed with HP Latex Inks and HP PVC-free Wallpaper are rated A+ according to Émissions dans l'air intérieur.
See anses.fr/en/content/labelling-building-and-decoration-products-respect-voc-emissions.

HP Latex Ink durability with textiles

The HP Latex R series, HP Latex 630, 700 and 800 series and HP Latex 2700 series are compatible with a range of textiles, such as polyesters and natural fiber blends. HP Latex prints are odorless, and due to the flexibility of HP Latex Ink, the hand of the un-printed material is maintained, even after it has been printed on.

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

- It is an easy-to-use alternative to dye sublimation, with no additional investment required in a calendar.
- You have the ability to print on a wider range of textiles: coated and uncoated textiles, **polyester**-based textiles, as well as **natural fibers** such as cotton and linen[9].

HP Latex Technology is suitable for:

- Short-term and indoor signs and graphics.
- Canvas.
- Home interior decoration: cushions, bags, bean bags, lampshades, tabletop decor and tapestry.

Good dry rub resistance of printed textiles is important to prevent damage during one's finishing, transporting, and installing operations. The standard used to measure the dry rub test is ISO 105-X12. Textiles with good or excellent results are scored as a 4 or 5, respectively.

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[9] Performance may vary depending on substrate—for more information, see the HP PrintOS app Media Locator (www.printos.com/ml/#/medialocator) or consult with your substrate supplier for compatibility details. For best results, use textiles that do not stretch.
[10] Washing tests performed at a max temperature of 30ºC, washed inside out, 1h cycle, and at a max spin of 400rpm.
[11] Heat fixation is required for specific textiles, e.g., Premex DuraVibe, at 175ºC and 80sec.

HP Latex Ink durability with textiles

Textiles printed with HP Latex Technology score a 4 or greater in dry rub, which makes them a good fit for Soft Signage applications. These textiles are classified as Durable Textiles and can be found at hp.com/go/mediasolutionslocator with the following logo:

Also, some textiles for interior decoration are classified as **washable**[10] when they undergo a heat-fixation process[11].

Customers are recommended to roll and not fold textiles printed with HP Latex Inks, in order to avoid crease lines and marks, especially on backlits, where light makes the defects more evident. If in doubt about the suitability for a specific application, customers should run their own tests first.

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.
- Flags requiring bleed-through.
- Stretched textiles (> 5% stretch).

[9] Performance may vary depending on substrate—for more information, see the HP PrintOS app Media Locator (www.printos.com/ml/#/medialocator) or consult with your substrate supplier for compatibility details. For best results, use textiles that do not stretch.
[10] Washing tests performed at a max temperature of 30ºC, washed inside out, 1h cycle, and at a max spin of 400rpm.
[11] Heat fixation is required for specific textiles, e.g., Premex DuraVibe, at 175ºC and 80sec.

Application warranties

All substrate 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. These are the:

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

To be covered by the above listed warranties, for those cases where protection is needed (overlaminate or liquid laminate), prints must be done without overcoat.

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, adhesion of overlaminate, and adhesion to substrate. It does not cover defects or failures due to interactions with the ink components. The duration of the warranty period depends on the combination of 3M film used, overlaminate, ink system, as well as the intended use of the graphic (vehicle, outdoor, watercraft, indoor).

For complete information on the 3M Performance Guarantee terms and conditions, as well as published matrices where the duration for each combination can be checked, refer to the 3M documentation available at 3Mgraphics.com/warranties or ask your local 3M representative.

Application warranties

3M™ MCS™ Warranty

The 3M™ MCS™ Warranty is a full finished graphic warranty and 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, adhesion of overlaminate, adhesion to substrate, and graphic removal over expected warranty term.

Certain fleet and vehicle graphics may also have a labor reimbursement component. The duration of the warranty period depends on the combination of 3M film used, overlaminate, ink system, as well as the intended use of the graphic (vehicle, outdoor, watercraft, indoor).

For further information on the 3M MCS Warranty terms and conditions, as well as published warranty matrices where the duration for each combination can be checked, refer to the 3M documentation available at 3Mgraphics.com (choose your country for more specific warranty information) or ask your local 3M representative.

Avery Integrated Component System (ICS) Performance Guarantee

The duration of the warranty period depends on the combination of Avery Dennison film used, overlaminate, 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 ask your local Avery Dennison representative.

Learn more

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