WHITE PAPER
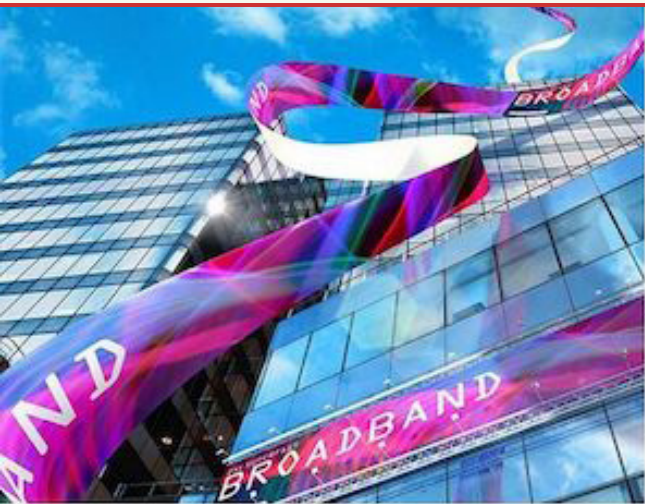
ON YOUR (GREEN) GUARD:
Understanding Environmental Certifications for Wall Décor Applications

ABSTRACT

One of the hottest growth markets for digitally printed display graphics has been wallcoverings and décor, especially "environmental graphics" for offices, healthcare facilities, schools, etc. And even before COVID, the residential market for digitally printed décor was starting to take off, a trend only exacerbated by the pandemic as more homes became offices. As we recover from the pandemic, and offices and other locations reopen, décor will only become more important. But at the same time, print service providers looking to tap into this market must understand environmental issues—not just overall sustainability but health and safety requirements for materials used in décor. To that end, various classification and certification programs have emerged to confirm the "greenness" of the assorted components of print production processes. But what do these certifications mean? Who confers them, and are they certifying truly sustainable materials? This white paper will sort out the details of the various programs that have certified the materials and consumables used by the Canon Colorado Printer Series of wide-format printers.

INTRODUCTION

One of the hottest markets for digitally printed display graphics has been wallcoverings and décor. In commercial spaces such as offices, healthcare facilities, schools, etc., "environmental graphics"—an application best described as where signage meets décor—has been a major growth area for several years. And even before COVID, the residential market for digitally printed décor was starting to take off, a trend only exacerbated by the pandemic as more homes became offices, and as we recover from the pandemic and more offices and other locations continue to reopen, décor will become even more important.

Forecasted worldwide wallcovering digital print volumes[1]
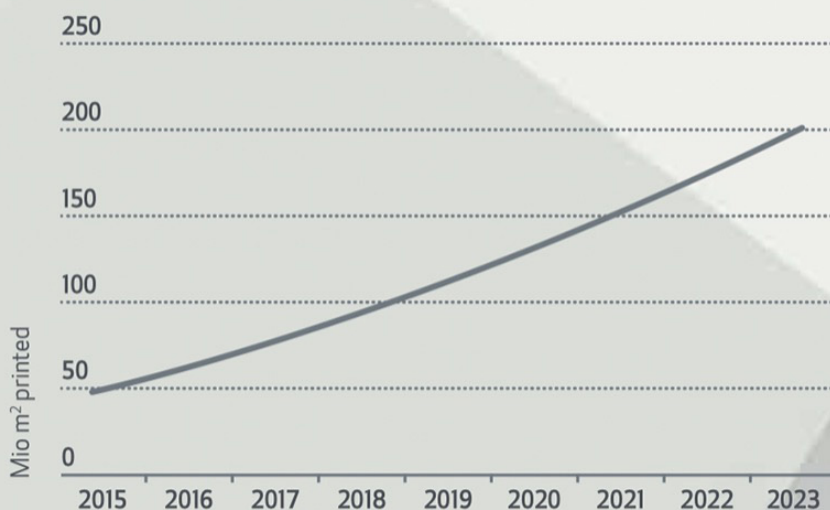
Source: The Future of Decorative Printing to 2023 (Smithers, 2018)

For many businesses and organizations, décor has become an essential extension of branding, and as rebranding cycles have increased, major interior (and exterior) décor projects have been a tremendous source of business for signage and display graphics providers. Smithers, for example, has been predicting double-digit growth for the digitally printed wallcoverings market, and other forecasts have been equally bullish.

That all said, print service providers looking to take advantage of this growth market must understand environmental issues—not just overall sustainability, but health and safety requirements for materials used in décor.

Sustainability has become one of the most important issues in virtually all manufacturing industries, including printing processes for display graphics, signage, and wall décor. Related to environmental sustainability are health and safety concerns, and not just the health and safety of print provider employees, but also printers' end customers. For example, do the consumables used in a printing process emit noxious chemicals that can sicken press operators or require the installation of expensive venting equipment? Does a final print give off an odor—be it toxic or not—when installed at a customer's location? Do the materials used in print production meet the criteria for use in highly sensitive environments like healthcare facilities and schools?

Choosing a specific print technology for décor—and by "print technology" we are referring primarily to the type of ink used—must balance basic aesthetic issues such as image/color quality and repeatability alongside performance criteria such as scuff-, water-, and UV-resistance and health and safety measures such as odor and chemical emission. This white paper will concentrate on the latter, but will touch on the other two as well.

DISPLAY GRAPHICS CONSUMABLES

All printing technologies have their unique environmental issues and requirements, but for the purposes of this white paper, we will confine our discussion to those issues specific to wide-format printing and the printing

of wallcoverings and décor.

There are several printing technologies used in display graphics production, some of which are more suitable for décor than others. To wit:

Electrophotography (EP): Digital printing systems that use dry toners. They can print on a variety of materials, although the cost of the equipment can make them prohibitive for smaller print providers. The high heat uses to fuse the toner to the substrate also makes them unsuitable for certain kinds of plastics, vinyls, and other heat-sensitive materials.

Solvent Inks: One of the most common types of wide-format/display printing technologies are made using volatile organic compounds (VOCs) which evaporate and dry quickly, which make them suitable for printing on a wide variety of papers, plastics, and vinyls. However, as we'll see below, these inks have significant environmental, health, and safety issues. A variety of solvent inks called "eco-solvent" has emerged which use less aggressive VOCs and are not as problematic as traditional solvent inks.

Ultraviolet (UV) Curing Inks: These are inks that dry upon exposure to ultraviolet light. When they cure, they form a solid polymer on the surface of the substrate. They can be used on perhaps the widest variety of flexible and rigid materials—and even three-dimensional objects. However, some rigid materials may call for some form of surface preparation to facilitate ink adhesion.

Latex Inks: A "latex" is defined as a "stable dispersion (emulsion) of polymer microparticles in an aqueous medium." These inks are water-based and their ability to print on a diverse array of materials from vinyls to textiles has made them highly suitable and desirable for décor applications. (It bears mentioning here that latex inks are perfectly safe for people with latex allergies.)

Dye-Sublimation Inks: These inks are predominantly used to print on fabrics, using either a transfer paper-based or a direct-to-fabric method. As the name of the inks indicates, the inks cure by first "sublimating" into a gas, melting and then penetrating into polyester fibers, and re-hardening, which is why dye-sub-printed materials exhibit great longevity and washfastness.

ENVIRONMENTAL, HEALTH, AND SAFETY ISSUES

In general, the bulk of the concerns surround the consumables used, often focusing specifically on the inks. Let's look at them in turn.

INKS

Chemicals used in the manufacture of printing inks can have a variety of adverse environmental impacts, both during the printing process and during disposal of waste ink. Specifically, the class of inks called solvent inks; the VOCs that promote fast drying can emit a noxious (or at the very least unpleasant) odor during printing, and for the purposes of operator safety, often necessitate the installation of ventilation equipment. Disposal of these inks also requires certain procedures as they can contaminate the ground water and other parts of the environment. These inks also contain other hazardous chemicals, such as heavy metals, that can have negative environmental impacts if disposed of improperly.

Other types of inks can have their own environmental impacts, as well, typically concerning their chemical components. UV-cured inks contain photoinitiators and other chemicals to promote the UV curing process. On the plus side, 100% of the ink is used during printing—unlike latex and solvent inks, where much of the ink vehicle is lost to evaporation into the air. UV inks also preclude the need for lamination, coating (pre- or post-), or other elements/processes. Eliminating this step in the production process can reduce waste and lower the overall production and material costs. In the past, UV ink would have rendered a graphic unrecyclable. However, with recent advancements in the drum-pulping and chemistry technologies in the market, the recycling process can now maximize the ink removal of newsprint and other paperboard products.

Latex inks, being largely water-based, are odorless and contain no VOCs and are acknowledged as being one of the most environmentally and workplace friendly inks. But, as we'll mention below, the heat needed to dry the inks does take them down a notch, greenwise, when energy consumption is factored into the equation.

SUBSTRATES

Wide-format printers can print on a variety of papers, films, plastics, boards, and other materials, not all of which are environmentally friendly, although the environmental impact primarily comes from waste and end-of-life issues (see below). In some signage and display applications, polyester fabrics are being used in lieu of PVCs, and while they are still "plastics" and are created from petroleum-based materials, their ease of recycling (among other issues not necessarily related to the environment) have made them preferable to PVC-based substrates.

ENERGY REQUIREMENTS

Inks that are largely water-based can require high amounts of heat to dry as quickly as is necessary. This results in excessive energy consumption which, depending on the source of a plant's electricity, can have an indirect yet adverse environmental impact.[1] UV inks cure immediately upon exposure to ultraviolet light, be it in the form of older mercury

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[1] Some printing facilities acquire their power using solar arrays, wind turbines, or other renewable means, either self-generated or acquired through an energy provider.

vapor lamps or newer LED-based curing lamps, the latter of which—also referred to as "cold cure"—use less energy and generate less heat. This has an added benefit of also being able to print on thinner substrates that may be damaged by exposure to heat, such as thin plastics.

END OF LIFE ISSUES

What happens to a graphic at the end of its life can also have an environmental impact. Dumping in a landfill vs. recycling is the biggest, but this is often out of the hands of the print services provider, although some printers (and even equipment manufacturers) have graphics "take-back" programs that will recycle printed materials that have reached the end of their "display life."

ENVIRONMENTAL ISSUES SPECIFIC TO WALLCOVERINGS/ DÉCOR

As we remarked earlier, many of these concerns are not just for overall environmental reasons, but also for purposes of health and safety, not just of print provider employees, but end users as well. As a result, various certifications have been devised to provide guidance on use of various inks and substrates—in display graphics applications in general and in wallcoverings and décor specifically.

Think about it this way. You have custom wallpaper printed for the living room in your home. It looks fetching, but, as you are sitting on the sofa, you notice a chemical odor emanating from the new wallcoverings. At best, it may just be annoying, but at worst it could pose a health hazard. And even if you don't notice a smell, some harmful chemicals are odorless. This is an extreme example, but the potential for noxious materials to leach out of a printed wallcovering is not unheard of, and specific locations—like schools, healthcare facili-

ties, and other public spaces—often regulate the kinds of materials that can be used for décor. And even where specific regulations may not exist, there at the very least best practices for providers of décor to these kinds of spaces.

COLORADO WIDE-FORMAT PRINTING: UVGEL INKS

One new class of ink related to UV inks cited above are the hallmark of the Canon Colorado Printer Series: the UVgel inkset, created specifically for the Colorado printers. UVgel inks are an LED UV-curable inkset that differ from other printing inks in that they are, as the name indicates, a gel at room temperature. During printing, the ink is heated in the printer and turns into a liquid. The liquid droplets are ejected onto the substrate, where they immediately cool back into a gel and are pinned to the substrate with the help of a partial LED "precure" process. Full curing then takes place at a later stage. A primary benefit of this "print-then-cure" process is increased speed. And because the ink droplets turn back into a gel when they hit the substrate, dot gain can be substantially reduced, since the printed droplets don't have the opportunity to expand the way they do in evaporative printing systems.

UVgel inks have been designed to print on the widest variety of materials, including vinyls and PVC-free materials, as well as uncoated and porous media at full production speeds. The Colorado series also offers a FLX finish option, which allows the operator to choose either a Matte or Gloss finish.

Another advantage of the UVgel inks is that they have been UL GREENGUARD Gold (see below) and meet the criteria for acceptable levels of chemical emissions.

CLASSIFYING WALLCOVERINGS

Before looking at specific certifications, it is important to identify what

kinds of wallcoverings we're talking about. There are two (sometimes three) basic categories of wallcovering, based on where specifically the wallcovering is going to be placed in terms of volume of traffic and abrasion potential.

Type I Wallcovering: Also called "Light Duty," Type I Wallcoverings are found in residential spaces or other kind of low-traffic environments.[2] The idea is that they won't be subject to a high degree of touch or abrasion.

Type II Wallcovering: Also called "Medium/Heavy Duty[3]," Type II Wallcoverings are found in more public or commercial settings where there is likely to be a fair amount of scuffing and other kinds of abrasion, such as classrooms, waiting rooms, corridors, and the like.

The difference between the types is a matter of weight. According to the Wallcoverings Association,[4] a Type I Wallcovering weighs between 12 and 19 ounces per linear yard, while a Type II wallcovering weighs between 20 and 28 ounces per linear yard. They also identify a Type III/Heavy Duty Wallcovering, which weighs between 33 and 36 ounces per linear yard.

There is also a class of commercial wallcoverings called "contract wallcoverings," which are produced for hotels, apartment buildings, office buildings, retail outlets, schools, and hospitals. These must be manufactured in accordance with CCC-W-408 (Federal Specification for Vinyl Coated Wallcoverings),[5] which specifies limits for characteristics like wash/scrub-ability, abrasion resistance, crocking (i.e., dye or other colorant transfer due to rubbing), stain resistance, tear resis-

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[2] Some wallcovering materials providers use "Type I" to refer only to wallcoverings used in commercial spaces, albeit low-traffic ones, such as private offices.

[3] "Heavy Duty" is sometimes referred to as a Type III Wallcovering.

[4] https://www.wallcoverings.org/page/TypesUsage

[5] https://www.govinfo.gov/content/pkg/GOVPUB-C13-7576711fb-1420da15ab4022f3d3f8083/pdf/GOVPUB-C13-7576711fb-1420da15ab4022f3d3f8083.pdf

GREENGUARD GOLD CERTIFICATION CRITERIA FOR BUILDING PRODUCTS AND INTERIOR FINISHES

Criteria	CAS Number	Maximum Allowable Predicted Concentration	Units
TVOC (A)	-	0.22	mg/m³
Formaldehyde	50-00-0	9 (7.3 ppb)	µg/m³
Total Aldehydes (B)	-	0.043	ppm
4-Phenylcyclohexene	4994-16-5	6.5	µg/m³
Particle Matter less than 10 µm (C)	-	20	µg/m³
1-Methyl-2-pyrrolidinone (D)	872-50-4	160	µg/m³
Individual VOCs (E)	-	1/2 CREL or 1/100th TLV	-

(A)   Defined to be the total response of measured VOCs falling within the $C_6 – C_{16}$ range, with responses calibrated to a toluene surrogate. Maximum allowable predicted TVOC concentrations for GREENGUARD Gold (0.22 mg/m³) fall in the range of 0.5 mg/m³ or less, as specified in CDPH Standard Method v1.2.

(B)   The sum of all measured normal aldehydes from formaldehyde through nonanal, plus benzaldehyde, individually calibrated to a compound specific standard. Heptanal through nonanal are measured via TD/GC/MS analysis and the remaining aldehydes are measured using HPLC/UV analysis.

(C)   Particle emission requirement only applicable to HVAC Duct Products with exposed surface area in air streams (a forced air test with specific test method) and for wood finishing (sanding) systems.

(D)   Based on the CA Prop 65 Maximum Allowable Dose Level for inhalation of 3,200 µg/day and an inhalation rate of 20 m³/day

(E)   Allowable levels for chemicals not listed are derived from the lower of 1/2 the California Office of Environmental Health Hazard Assessment (OEHHA) Chronic Reference Exposure Level (CREL) as required per the CDPH/EHLB/Standard Method v1.2 and BIFMA level credit 7.6.2 and 1/100th of the Threshold Limit Value (TLV) industrial work place standard (Reference: American Conference of Government Industrial Hygienists, 6500 Glenway, Building D-7, and Cincinnati, OH 45211-4438).

tance, fungus resistance, colorfastness, and more. The specifics of CCC-W-408 are probably a bit "TMI" for a print provider, but it's important to note the differences between and among the various kinds of wallcoverings.

There are other wallcovering standards developed by the Wallcoverings Association (WA), which, again, you don't need to know in detail unless you are manufacturing wallcoverings, but at least being familiar with the basics can make you a good resource for clients. These other regs include:

- **W-101 (WA Quality Standard for Polymer Coated Fabric Wallcovering)[6]:** Includes standards for such attributes of polymer-coated fabrics as weight, physical strength, tear properties, flammability, UV fade resistance, stain resistance, and scrubbability. The WA also has a W-102 standard which expands W-101 to include other kinds of substrates such as plastics, stone surfaces, and textiles. The WA also supports NSF International's Sustainability Standard (NSF-342) which, they say, "The standard covers product design, product manufacturing, long term usage, and value, corporate responsibility, as well as innovation. While there are several similar standards regarding the issue sustainability of building products, no other standard has attempted to bring in the full distribution chain in the evaluation of a product."

- **ASTM-F-793 (Standard Classification of Wall Covering)[7]:** Sold by ASTM International, this classification provides appropriate use characteristics and criteria by which wallcoverings can be chosen for particular residential and commercial decorating applications.

You may also need to be aware of any fire safety codes:

- ASTM E-84 (Standard Test Method for Surface Burning Characteristics of Building Materials)[8]

6 https://www.wallcoverings.org/page/WallcoveringStandard
7 https://www.astm.org/Standards/F793.htm
8 https://www.astm.org/Standards/E84.htm

- NFPA (Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth)[9]
- NFPA 101 (Life Safety Code)[10]

A more detailed look at fire safety codes for wallcoverings is a bit beyond the scope of this white paper, but if you want or need to go further down that rabbit hole, you can click through the appropriate links.

CERTIFICATIONS

It's not hard to find environmental or health and safety certifications. Any company or organization—or individual—can develop a standard based on dubious inputs or testing and, sincerely or misleadingly, promote it to manufacturers and consumers. But without knowing what a certification actually means, how certifications are awarded, and without knowing at least a little something about the creator of that certification, it's not especially helpful information—and could actually be harmful. (Yes, we're shocked, shocked, to discover that there can be fraud in certification programs.) So it's important to always consider the source of a particular certification and the reputation of the certifying body.

UL GREENGUARD GOLD

The gold standard, as it were, for environmental and health and safety certification is UL's UL GREENGUARD Gold. Founded in 1894, UL[11] (formerly called Underwriters Laboratories, but know known just as "UL") basically performs safety tests and analyses of a wide, comprehensive assortment of technologies and products. UL is also approved to perform safety testing by the Occupational Safety and Health Administration (OSHA).

The GREENGUARD Certification program[12], says UL, identifies products that have been scientifically proven to meet some of the world's most rigorous third-party chemical emissions standards. The program is designed to help reduce indoor air pollution and the risk of chemical exposure. The GREENGUARD Gold Certification standard goes even further, and adds health-based criteria for additional chemicals and lower VOC emissions to identify products that are acceptable for use in environments like schools and healthcare facilities.

It is worth noting that Canon's UV-gel inks meet the criteria and have been awarded a UL GREENGUARD Gold Certification.

AGBB

The European Committee for Health-Related Evaluation of Building Products has developed an emissions criteria certification program called AgBB[13]. Originally developed to set criteria for chemical emissions from outdoor construction projects, AgBB has been expanded to include criteria for chemical emissions from indoor construction and décor materials.

It is also worth noting that the UVgel inks have been AgBB-certified.

The AgBB testing methodology has formed the basis of other common European eco-labels you may come across, including:

- **Blue Angel:**[14] A 40+-year-old label that certifies that various construction and décor materials are particularly environmentally friendly.
- **GEV EMICODE:**[15] A label awarded by the Association for the Control of Emissions in Products for Floor Installation, Adhesives and Building Materials that identifies low-emission flooring underlays and construction products.
- **Natureplus:**[16] A label awarded by the International Association for Sustainable Building and Living–natureplus e.V., which developed

the label in cooperation with several testing bodies (among them eco-INSTITUT). The emphasis of this label is to identify products that have been manufactured with a high percentage of renewable and/or mineral raw materials.

- **eco-INSTITUT-Label:**[17] Awarded by the eco-INSTITUT, this label identifies products are low in emissions and hazardous substances and can be used as desired in construction and decoration projects and for furnishing living and working spaces. The eco-INSTITUT says that products bearing its label "are the first choice for health-conscious consumers when making their purchasing decisions."

These eco-labels typically apply to construction materials and floorcoverings rather than wallcoverings per se, but there can be some overlap, depending on the specific project. These programs are predominantly European, so North American print providers may not encounter them very often, but as manufacturers sell to different regions, they will need to be certified for those regions.

THE SUSTAINABLE GREEN PRINTING PARTNERSHIP

I feel obliged to plug an organization I have been covering for more than 15 years: the Sustainable Green Printing Partnership (SGP).[18] SGP is a non-profit organization that offers a rigorous certification process for printing

9 https://www.nfpa.org/
10 https://www.nfpa.org/codes-and-standards/document-information-pages?mode=code&code=101
11 https://www.ul.com/
12 https://www.ul.com/resources/ul-greenguard-certification-program
13 https://www.eco-institut.de/en/portfolio/agbb-schema/
14 https://www.eco-institut.de/en/portfolio/blue-angel/
15 https://www.eco-institut.de/en/portfolio/gev/
16 https://www.eco-institut.de/en/portfolio/natureplus-qualitaetsze-ichen/
17 https://www.eco-institut-label.de/en/
18 https://sgppartnership.org

facilities' sustainability best practices, going beyond mere regulatory compliance. SGP is a "multi-attribute certification" that was created by the printing industry for the printing industry. It takes into account the entire facility, its processes, products, and social areas. Printing facilities of all types and sizes in the United States and Canada are eligible to become SGP certified. There are fewer than 100 plants certified by SGP, but they are an elite group often specifically sought out by major brandowners and other print buyers concerned about the sustainability of their entire print supply chain.

WHY USE CERTIFIED CONSUMABLES?

One of the biggest vertical markets for signage and display graphics has been healthcare—even before COVID. As a result, tapping into this market often requires that the materials used in wall décor and other graphics in these environments be GREENGUARD GOLD certified. Remember, though, that printing is not just ink, but substrate as well, and many of these kinds of institutions—and others, such as schools—look at the

health and safety of all the components of wall décor. So you will need to do your homework when choosing specific substrates for these high-sensitivity markets. The Federal and WA standards and criteria cited earlier can help conduct this due diligence.

Even if you are not going after these kinds of markets, more and more businesses and consumers are paying closer attention to not just health and safety but also environmental matters. The more you can demonstrate commitment to helping address these concerns, the bigger competitive advantage you may have over other print service providers.

CANON COLORADO PRINTER SERIES

The UVgel inks were developed for the Canon Colorado Printer Series. Launched in 2017 with the Colorado 1640 64-inch roll-to-roll printer, the line has expanded to include the Colorado 1650 printer, which not only added the FLX Finish technology, but also featured an updated UVgel inkset that was formulated for maximum flexibility by increasing the "stretchability" of each cured ink droplet. The Colorado 1650 printer can print at a top speed of 159 m^2/hr. for applications such as billboards

or outdoor banners, making it faster than any other printer in this segment.

Canon Colorado 1650 Printer — The most recent addition to the Colorado series is the Colorado 1630 printer, which puts the advantages of UVgel ink technology in a lower-priced, more modular machine that can be customized and upgraded based on a print service provider's unique—and changing—business needs.

CONCLUSION

As we emerge from the pandemic, décor printing is slated to rise, as offices reopen and people heads back to work. At the same time, the burgeoning residential market for customized, digitally printed décor will also continue the upward trajectory that began pre-COVID. However, for print service providers looking to expand into these applications and markets, it pays to "call before you dig" and understand the requirements—or at least the best practices—for wallcovering print production and installation. Understanding wallcovering types and especially consumables certification programs can go a long way toward ensuring that you are a valuable, educational resource for your clients.