December 2010

HPDL vs. LPL

Wilsonart International—Technical Services

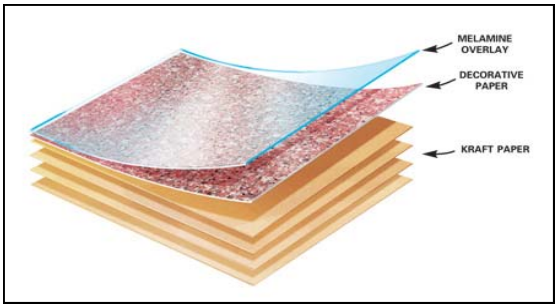
Highlights of this Bulletin

High Pressure Decorative Laminate (HPDL) and Low Pressure (LPL) products often compete with one another in applications.

It is important to understand the benefits and limitations of each when considering application and value-engineering.

Overview——High Pressure Decorative Laminates (HPDL)

High Pressure Decorative Laminate (HPDL) is composed of resin-impregnated kraft paper, decorative paper face material and a clear melamine-impregnated overlay. These sheets are bonded at pressures greater than 1000 pounds per square inch and temperatures approaching 300 F (149°C). Pressed sheets are trimmed, and then sanded on back to facilitate bonding to suitable substrates such as Particleboard or MDF (Medium Density Fiberboard).



HPDL is available in hundreds of solid colors, woodgrains and abstracts with multiple finishes to select from as well.

There are many "product types" or grades designed with specific performance capabilities. Basic HPDL types include Vertical (VST), Postforming (PFT) and General Purpose (GST). HPDL types also include chemical-resistant, fire-rated, impact and wear resistant types for high-demand applications.

Typical nominal thicknesses range from 0.028" to 0.048" (0.71 mm to 1.22 mm), each offering different performance characteristics.

HPDL is commonly used in horizontal and vertical applications, both commercially and in residences.

HPDL is used regularly on both horizontal and vertical surfaces, especially in high traffic or high usage areas. Performance and specialty types (like digitally printed laminates) expand the opportunities for use.

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Overview—Low Pressure Laminate (Melamine)

Low Pressure Laminates (LPL) may also be called "TFM" or "thermofused melamine." LPL is generally offered in panel form. It consists of decorative paper impregnated with melamine resin which is bonded directly to particleboard or MDF (medium density fiberboard) substrate.

No adhesives are used in making LPL panels as the resins in the paper "fuse" the paper onto the board. The manufacturing process works with low press pressure (20-30 bar) and high temperature (170-190°C).

LPL paper is specifically engineered to be thermally fused to a substrate. Because of this it does not have the kraft paper core that distinguishes HPDL, thus impact resistance is lower. LPL panels may be used in vertical, low impact or low wear applications, but are not typically recommended for countertops.

- Commercial (store fixtures, toilet partitions and office furniture)
- Institutional (hotel and restaurant furniture)
- Residential (bathroom vanities, entertainment centers and closet shelving systems)

Low Pressure Laminates are often used horizontally in areas with minimal impact or abrasion

Performance Standards

This information compares the respective industry performance standards as listed in NEMA LD-3 2005 for High Pressure Decorative Laminates (HPDL) and ALA 1992 performance standards for Low Pressure Melamine (LPL) papers.

Test Description	Horizontal Grade Standard (HGS) 0.048"		Horizontal Grade Postforming (HGP) 0.039"		Vertical Grade Postforming (VGP) 0.028"		Min Requirements to Comply with ALA 1992***	
	NEMA-LD3-2005	WA Typical Values	NEMA-LD3-2005	WA Typical Values	NEMA-LD3-2005	WA Typical Values	Solid Colors (Direct Pressure)	Wood Grains (Direct Pressure)
Wear Resistance	400	700	400	700	400	700	400	125
Stain Resistance *	1-10 =NE 11-15 = M	1-10 =NE 11-15 = M	1-10 =NE 11-15 = M	1-10 =NE 11-15 = M	1-10 =NE 11-15 = M	1-10 =NE 11-15 = M	1 - 23 = NE 24 - 29 = M	1 - 23 = NE 24 - 29 = M
Cleanability* **	SL	SL	SL	SL	SL	SL	NE Surface cleaned in 10 or fewer strokes	NE Surface cleaned in 10 or fewer strokes
Light Resistance	SL	SL	SL	SL	SL	SL	SL	SL
High Temperatur	SL	SL	SL	SL	SL	SL	SL	SL
Radiant Heat Resistance	125 sec.	160 sec.	100 sec.	140 sec.	80 sec.	120 sec.	60 sec.	60 sec.
Boiling Water Resistance	NE	NE	NE	NE	NE	NE	NE	NE
Impact Resistance	50"	65"	30"	55"	20"	40"	15"	15"

*Rating System: NE - No Effect, SL – Slight Effect, M – Moderate Effect, S- Severe Effect
** The LMA 1992 grading system is not consistent with NEMA LD3-2005.
***All direct pressure information has been obtained from the Voluntary Product Standards and Typical Physical Properties of Decorative Overlays Published by Laminating Materials Association Inc. 1992

This table presents a comparison of physical properties from a typical (similar) sample set. NEMA testing of the surface performance illustrates the primary areas where HPDL has significant advantages. Wear resistance values were typical of standard HPDL/LPL with no additional surface enhancements (no AEON or enhanced overlays). Case Flexural (or bookshelf testing) is a comparison of the load bearing strength of the panels and illustrates the "stiffening effect" of laminating both sides of a panel with HPDL vs. LPL. Other structural aspects are also enhanced as observed in the ASTM testing below. Note the relative increase as indicated. Δ

	ASTM 1037 - *Independent Testing Facility*					ASTM D1037 Direct Screw Pull	ASTM D790 Flexural - *Wilsonart Materials Testing lab*					
	Thickness (in)	Max Load (lbs/f)	MOR (psi)	MOE (psi x 1000)	Density (lbs/ft³)	Max Load (lbf)	MOR (psi)		MOE (psi x 1000)	Strain at Max	Max Load at Yield	
Low Pressure Melamine	0.75	134	2144	423	46.2	311.18	md	2383	191	1.615	672.16	Tested Low Pressure side up
							cd	2258	174	1.611	640.02	Tested Low Pressure side up
WA335/PB/PVA	0.781	245	3618	527	47.2	433.03	md	3092	224	2.014	969.27	Tested Laminate Face Down
							cd	3089	207	2.09	966.45	Tested Laminate Face Down
WA350/PB/PVA	0.795	262	3749	551	48.3	441.03	md	3520	227	2.234	1104.43	Tested Laminate Face Down
							cd	3105	201	2.197	933.67	Tested Laminate Face Down
WA107/PB/PVA	0.804	260	3620	517	47.2	438.03	md	2827	207	2.077	916.537	Tested Laminate Face Down
							cd	2949	195	2.173	967.01	Tested Laminate Face Down

modulus of rupture (MOR) *and static modulus of elasticity* (MOE)

Δ

This is the relative increase/ decrease between the LP specimen and the various HPL assemblies	*82.8%*	*68.8%*	*24.6%*	*39.2%*	*29.8%*	*17.3%*	*24.7%*	*44.2%*
	95.5%	*74.9%*	*30.3%*	*41.7%*	*47.8%*	*18.8%*	*38.3%*	*64.3%*
	94.0%	*68.8%*	*22.2%*	*40.8%*	*18.6%*	*8.4%*	*28.6%*	*36.4%*

	Case Flexural				NEMA LD 3-2005 or (Internal)					
	Span	Stress @ MaxLoad (psi)	Strain @ Max Load (%)	*Stress @ MaxLoad (psi) Increase*	Wear Resistance IP (cycles)	Wear Resistance (cycles)	Ball Impact (inches)	Dart Impact (inches)	Static Load (psi)	Stains/Cleanability, Fade, Hot Water, Radiant Heat
Low Pressure Melamine	22"	1073.7	0.23		23	100	16	6	750	equal / same
	24"	1235.2	0.196							
	36"	434.72	0.091							
WA335/PB/PVA	22"	1502.8	0.233	*40.0%*	93 *(304.3%)*	450 *(350%)*	37 *(131.3%)*	18 *(200%)*	1000	equal / same
	24"	1373.9	0.198	*11.2%*						
	36"	650.79	0.091	*49.7%*						
WA350/PB/PVA	22"	1718.5	0.232	*60.1%*	178 *(673.9%)*	500 *(400%)*	54 *(237.5%)*	30 *(400%)*	1000	equal / same
	24"	1514	0.196	*22.6%*						
	36"	721.13	0.09	*65.9%*						
WA107/PB/PVA	22"	1735.7	0.233	*61.7%*	132 *(473.9%)*	450 *(350%)*	67 *(318.8%)*	30 *(400%)*	1000	equal / same
	24"	1490.4	0.196	*20.7%*						
	36"	740.42	0.091	*70.3%*						

All samples were produced from the same production lot of substrate. Results are from one sample set.