



# Direct Embed<sup>®</sup> Coating System

## Technical Specifications

Direct Embed Coating System is a highly customized sign printing technology developed by Direct Embed Coating Inc. based on powder coated graphics, a durable sublimated photo quality methodology for outdoor and indoor signs. Direct Embed powder coating utilizes high quality, heat treated aluminum alloy sheeting with an organic material under controlled conditions. This coating is fused with the aluminum and becomes the substrate upon which ink is applied, eliminating paper, vinyl or plastic from the printing process. Once imaging is completed, an organic topcoat is applied, fused and bonded with the ink and substrate, sealing the image between the topcoat and substrate. This protects the four-color print from harmful UV rays, water, hail, sand, rain, graffiti and vandalism.

### Imaging

The Direct Embed Coating System process is done on a flatbed inkjet printer utilizing inks that have been carefully tuned to the process. Utilizing input resolutions ranging between 200 and 300 dpi, the output resolution is printed at 1200 dpi, providing accurate, bright and vibrant reproduction of continuous tone photographic images. This technology is also well-suited to reproducing small text and fine detail with amazing accuracy. All images are created in CMYK color space.

### Attributes

Direct Embed<sup>®</sup> technology and fabrication creates highly durable signs with the following attributes:

- The only durable printing methodology capable of complex dimensional shapes and forms
- Can be integrated into large architectural projects
- Capable of curved and perforated surfaces and meshes
- Low cost of ownership
- Bright, vibrant graphics
- Self supporting in most common sign sizes
- Extremely strong
- Substantially lighter than other durable sign technologies
- Will not corrode if vandalized
- Graffiti cleans off easily with available cleaners
- Scratch resistant
- Superb UV protection (10-year warranty)
- Excellent weather and impact resistance
- Vandal resistant
- Will not delaminate
- Will not blister, crack or peel
- Signs available in thicknesses from .023 to .250 inches
- Direct Embed<sup>®</sup> fabrication also enables in flexible, wrapable graphics
- Available in contoured shapes, with or without mounting holes and with or without stainless steel studs and tamper-proof hardware on the reverse side of the sign
- Direct Embed<sup>®</sup> signs are printable on one side or both sides of the sign
- Direct Embed<sup>®</sup> signs are heat-treated to prevent expansion, contraction and curl

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**Sign Applications** Direct Embed® printing technology is designed to produce durable photo-quality color images on flat or three-dimensional surfaces. Working with aluminum, steel, glass, ceramic, and various other sustainable materials, Direct Embed® Coating System is the perfect solution to high-traffic locations or remote outdoor areas. Backed by up to 10 years of warranty, it is one of the world's most durable interior and exterior processes creating hydrophobic, graffiti and vandal resistant finish. It performs well in all climates: in direct sun, shady humid areas, extreme mountain conditions, seashores, and arid deserts. Applications of the Direct Embed® signs include:

- Wayfinding signs (parks, trails, campuses, business parks, malls, etc.)
- Interpretive signs and displays
- Exhibit signs, displays and murals
- Regulatory signs
- Corporate identity signage
- Museum signage
- Zoos and aquariums
- Retail signage (restaurants, bars, retail stores, etc.)
- Parking lot and garage signage
- Resort, theme park and recreational facility signage
- Architectural signage
- Monument signs (city welcome signs, park entrance, sub-divisions, industrial parks, etc.)
- Institutional signage (universities, government facilities, hospitals, etc.)
- Gas station/convenience store signage

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**Dimensional Shapes and Forms** Direct Embed® is capable of integrating graphics into complex dimensional forms. When developing dimensional objects make sure to consult Direct Embed staff closely, including both specifically sized graphics and a digital dimensional model of possible. For perforated forms Direct Embed will provide a sample of visual approach.

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**Standard Panel Thicknesses** Direct Embed® printing is used on three different configurations of signs with varying thicknesses:

### **Rigid signs**

Direct Embed® signs have a standard thickness of .125 inches and are rigid enough to perform well without a backer plate or frame up to 24 x 36 inches on free-standing exhibit bases. If the sign is to be mounted on an exhibit base and is larger than 24 x 36 inches, a frame is recommended. Free-standing, framed Direct Embed® signs can be sized up to 36 x 48 inches without concerns about structural integrity. Vertical surface mountings do not have this restriction. Custom thicknesses up to .250 inches are available upon request.

NOTE: Temperature extremes have been known to cause expansion and contraction of outdoor signs with alternate sign technologies such as HPL, Fiberglass Embedment, Polycarbonate and Porcelain Enamel. Direct Embed® sign panels are heat treated at the factory to significantly reduce and/or prevent expansion, contraction and curling of the signs.

### **Flexible Signs**

Direct Embed® printing technology is also used to print flexible aluminum signs that can wrap a post down to 4 inches in diameter. The standard aluminum substrate material on our flexible wrap signs is .032 inches which can wrap a round object down to 6 inches in diameter.

## Sign Panel Mounting Options

### Extruded frames

These attractive extruded frames can be powder coated with mitered corners to create an attractive mounting configuration for Direct Embed Coating sign panels. These frames can then be mounted to any number of exhibit base configurations including upright legs and cantilevered stands.

### Bolt-through

Specify location and size of hole required for mounting the sign panels. The holes will be pre-cut and coated at the factory. Tamper-proof hardware is available if required.

### Z-clip mounting

This mounting configuration includes clips that are screwed to the wall and clips adhered to the back of the sign which interlock to form a secure mounting.

### Stainless steel studs

In those applications where the sign panel is to be mounted to another sign or to a back plate with concealed hardware, stainless steel studs on the back side of the sign are an excellent option. We offer flush mounted, stainless steel studs which are adhered to the backside of the sign panel with an adhesive. Each stud has a plate welded to the stud, creating a large surface on which to secure our bond with the aluminum sign. The studs are available with or without tamper-proof nuts and washers. The specifications on each stud size are indicated in the chart below. Each stud size has been engineered to provide high tensile and shear strength, ensuring that the sign panels are secure once mounted. Please see the chart below to select the appropriate stud size.

#### Stainless Steel Stud Selection Chart

STUD SPECIFICATION	LENGTHS AVAILABLE (IN)	PLATE DIAMETER & THICKNESS (IN)	TENSILE STRENGTH (LBS/STUD)	SHEAR STRENGTH (LBS/STUD)
1/4 X 20	.75, 1.0, 1.5, 1.75, 2.0, 2.5	1.25 X .058	500	650
5/16 X 18	1.5	2.0 X .080	1200	1500
3/8 X 16	.75, 2.0	2.0 X .080	1200	1500

Note: Stud material is Type 304 Stainless Steel

#### Tamper Proof Nuts and Washers

SIZE	WIDTH (IN)	DIAGONAL WIDTH (IN)	HEIGHT (IN)
1/4 X 20	1.05	1.28	.23
5/16 X 18	1.05	1.28	.23
3/8 X 16	1.05	1.28	.23

Note: Add washer thickness to nut height dimension to get the exact required height

## Panel Sizes

Rectangular signs printed with Direct Embed® technology are available in sizes up to 48" x 120". If the sign is specified as a contoured shape, the maximum width of the sign panel cannot exceed 47 3/4", allowing 1/8 inch on each side for cutting. Murals of any size can be created by tiling Direct Embed® panels together. When creating murals, the graphics will be indexed over the entire surface of the mural.

## Contoured Shapes

Direct Embed® signs can be cut to most shapes on our CNC routers. The minimum size router bit we utilize is a 1/8 inch bit. This determines the maximum inside angles we can cut on the sign panels.

Note: It's standard practice to round all panels (except tiled) with a minimum of 1/8 inch radius, to minimize sharp corners. Please specify the radius of the corners on any panels ordered.

### ASTM Mechanical Performance Specifications

MECHANICAL PROPERTIES	ASTM TEST	GRADING
Scratch resistance	E-18	Meets or exceeds 8H Pencil Test
UV resistance	G115; D7238	Delta E <10.0
Gloss level	D523	35 ±5 gloss units
Abrasion resistance	D4060-10; D968-05	Pass/Fail test
Indentation hardness	N/A	Barcol rating = 56B
Impact resistance	D2794-93	>60 in. lbs/inch
Clarity	D1003	Clarity of underlying images
Chemical and stain resistance	D1308	No damage to finish when doing spot test
Fire/flare/smoke resistance	E84	Class A rating
Corrosive weather resistance	D1654; B-117	<5 mm creep when exposed to acidic salt spray
Adhesion	D3359	5B classification
Chalking	D4214	No chalking for 10 years
Hydrophobic	N/A	Highly graffiti resistant

## Standard weights

Direct Embed® signs vary in weight based on the thickness of the aluminum used in its construction

SIGN TYPE	THICKNESS	WEIGHT / SQFT
Direct Embed® - Rigid	.125"	1.75 LBS
Direct Embed® - Rigid	.250"	3.53 LBS
Direct Embed® Flexible	.032"	0.45 LBS

Note: Contact factory for thicknesses and/or weights not shown on the chart above if required.

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## Sign finish

Outdoor signage is generally subject to exposure to bright daylight conditions which can cause glare and compromise the ability to read the sign. For this reason, we have designed Direct Embed® signs with a gloss level that provides optimal clarity and sign visibility in conditions ranging from bright sunshine to shade.

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## Cleaning

When removing pine sap, dampen a soft cloth with mineral spirits, denatured alcohol or isopropyl alcohol and gently rub the surface until the sap is gone. Direct Embed® Systems LLC's Graffiti- ZAP works best at dissolving the sap without damaging the surface. After removing sap from the sign's surface, or anytime the Direct Embed® signs are cleaned, use mild soap and water to remove oily films, dirt, dust, road film and other naturally occurring contaminants from the finish. Do not use abrasive cleaners or acids on the surface as it may damage the finish.

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## Graffiti removal

Cleaning graffiti (especially paints) off Direct Embed® signs is much easier if you get to it within 24 - 48 hours. Crayon, permanent markers, inks and paints can generally be removed from Direct Embed® signs easily using Direct Embed® Systems LLC's Graffiti-XXX organic graffiti remover. Other possible cleaners to try are methyl alcohol, butanol, or isopropyl alcohol. All of these cleaners are mild solvents and can cause skin irritations. We recommend wearing protective gloves such as Nitrile disposable gloves when handling Graffiti- ZAPT or any of the cleaners referenced above.

CAUTION: Always test graffiti cleaners in a small inconspicuous area to make sure they are compatible and do not damage the surface of the sign. Do not use abrasives or metal brushes on the surface of Direct Embed® signs.

### Permanent marker, crayon, inks

1. Saturate a section of a shop rag with Graffiti-ZAPTM graffiti remover.
2. Working from the top of the sign down, rub the wet rag over the graffiti using a light, circular rubbing motion to remove it. If it begins to smear, select a clean saturated section of the rag and continue light rubbing until the graffiti is gone.

### Paints

Paints must be dissolved and removed in layers; depending on thickness of the graffiti paint, it may require two or three applications of Graffiti-ZAPTM for complete paint removal

1. Working from the top of the sign down in 2 square foot sections, spray the paint graffiti with Graffiti-ZAPTM to thoroughly cover and wet the surface of the paint. Graffiti- ZAPTM is a mild solvent. Let it saturate the graffiti for one to two minutes before brushing or rubbing.
2. Using the small nylon brush included with your Graffiti-ZAPTM kit, begin brushing the surface of the paint in a straight back and forth motion, using light to medium pressure on the brush to loosen the paint. This back and forth motion cuts micro-grooves into the surface of the paint, increasing Graffiti-ZAP's ability to penetrate the paint and release its bond from the surface of the sign.
3. Saturate a shop rag with Graffiti-ZAPTM graffiti remover.

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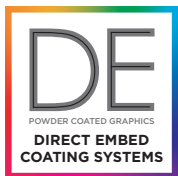
## Graffiti removal (continued)

1. Using the saturated shoprag, begin rubbing it over the paint with firm pressure in a straight back and forth motion to remove the layers of paint that have been dissolved and/or loosened. Change the section of the saturated rag that is in contact with the sign frequently to avoid building up paint on the rag and smearing the sign. If stubborn paint layers remain, don't apply excess force to remove them. Let Graffiti-ZAPTM do the work.
2. Spray the surface of the remaining paint with Graffiti-ZAPTM once again to thoroughly wet the remaining paint. Let it saturate the paint for one to two minutes.
3. Using the small nylon brush, begin brushing the surface of the paint in a straight back and forth motion, using light to medium pressure on the brush to loosen the remaining paint.
4. Using a clean, saturated section of the shop rag, begin rubbing it over the remaining paint with firm pressure in a straight back and forth motion to remove any existing paint. Change the section of the saturated rag frequently to avoid building up paint on the rag and smearing the sign. If necessary, repeat steps 5 through 7 until the paint is gone and the surface of the sign is clean.
5. Repeat this process on all other sections of the sign damaged by graffiti
6. Using a clean shop rag saturated with Graffiti-ZAPTM solvent cleaner, wipe down the entire sign to remove any paint or graffiti splatters that may exist.
7. Wash the entire surface of the sign with soap and water to remove any remaining Graffiti-ZAPTM from the sign.

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## Maintenance

Direct Embed® signs are relatively maintenance free due to the durability of these signs. Never-the-less, an occasional washing with mild soap and water will help retain the original color and vivid graphics on the sign.



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