

ENCOR[®] DT 400

FOR TRAFFIC PAINT APPLICATIONS



Product Benefits

ENCOR[®] DT 400 is a high performance binder for durable waterborne traffic markings applied at higher line thickness of 22-30 mils wet. Traffic markings based on ENCOR[®] DT 400 offers enhanced cost/performance benefits versus other durable traffic marking systems based on thermoplastic, epoxy, polyurea, MMA or tapes.

Compared to the competitive commercial waterborne traffic marking latexes, ENCOR[®] DT 400 contributes higher overall performance with superior dry time, early water resistance and bead/substrate adhesion. ENCOR[®] DT 400 is the high-performance choice for high-build, durable waterborne traffic paints.

Polymer Design

- High Performance Styrene Acrylic Polymer

Performance Benefits

- Fast dry
- High film-build without cracking
- Cost effective vs. other industry-standard durable binders
- Exceptional water resistance
- Freeze-thaw / Heat-Age stable formulations
- Compatible with industry-standard formulations
- Conforms to TIP 1952E

Typical Polymer Properties¹

Appearance	White Liquid
Total Solids, % by weight	50.5
Weight per Gallon, lb	8.7
pH Value	10.5
Particle Size, µm	0.2
Viscosity, Brookfield, cP	300 max
Minimum Filming Temperature, °C	18
Glass Transition Temperature, °C	23

¹The data provided for these properties are typical values, intended only as guides, and should not be construed as sales specifications.



A Winning Combination

Unlike standard formulations that are applied at 1.5-mils wet thickness and designed to accommodate Type II glass beads, traffic markings formulated with ENCOR® DT 400 can be applied at 22-30 mils wet film thickness. In fact, to achieve full performance capabilities, formulators must use large diameter glass beads in the range of 800-1200 microns with ENCOR® DT 400. This winning combination will result in traffic markings with excellent visibility in wet-night conditions and a significantly greater lifespan.

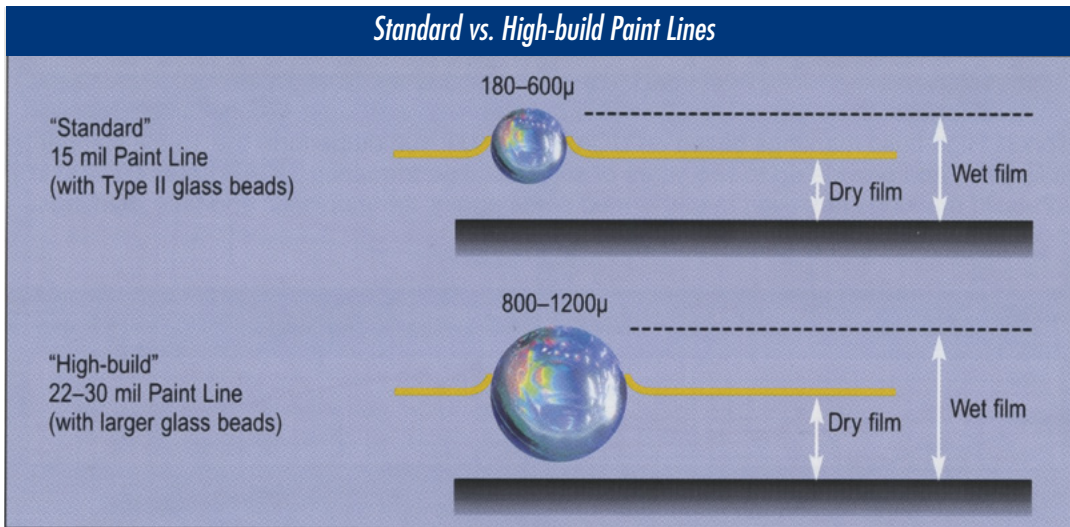


Figure 1: Illustrates the difference in thickness between standard (Type II glass beads) and "high-build" (larger 1000-micron glass beads) paint lines and how this variation affects a line's ability to accommodate larger glass beads.

Increase in Performance

As the following photos of the 2000 National Transportation Product Evaluation Program (NTPEP) test deck confirms, durable markings formulated with ENCOR® DT 400 show much higher performance versus standard 1.5-mil paint lines.



Figure 2

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Durable markings formulated with ENCOR® DT 400 and a commercial “self-crosslinking” traffic emulsion designated as “Commercial H” were applied at 30 mils. A 15-mil paint marking based on a premium 100% acrylic fast dry traffic emulsion was also evaluated and served as a benchmark for standard performance. Formulation components such as resin content and pigment volume concentration were virtually identical for both durable traffic paints. Large diameter, high round glass beads applied at 12 lb/gallon of paint were used with the 30-mil durable markings, while standard Type II drop-on beads applied at 6 lb/gallon of paint were used with the 15-mil markings. All of the markings were applied to concrete and asphalt. Deck exposure included an average daily traffic rate (ADT) of 15,000 vehicles and two winter

seasons of snow plowing. Pennsylvania Department of Transportation (PENNDOT) personnel evaluated the markings for retro-reflectivity and durability from July 2000 to July 2002.

In correlation with the NTPEP test deck data, **Figures 3 and 4** illustrate the retro-reflectivity and durability performance of ENCOR® DT 400 paints with large beads on concrete and asphalt. High-build markings based on ENCOR® DT 400 outperform the 15-mil standard traffic paint and provide up to two years of successful performance. ENCOR® DT 400 in high-build markings has even outperformed some epoxy, thermoplastic and tape markings.

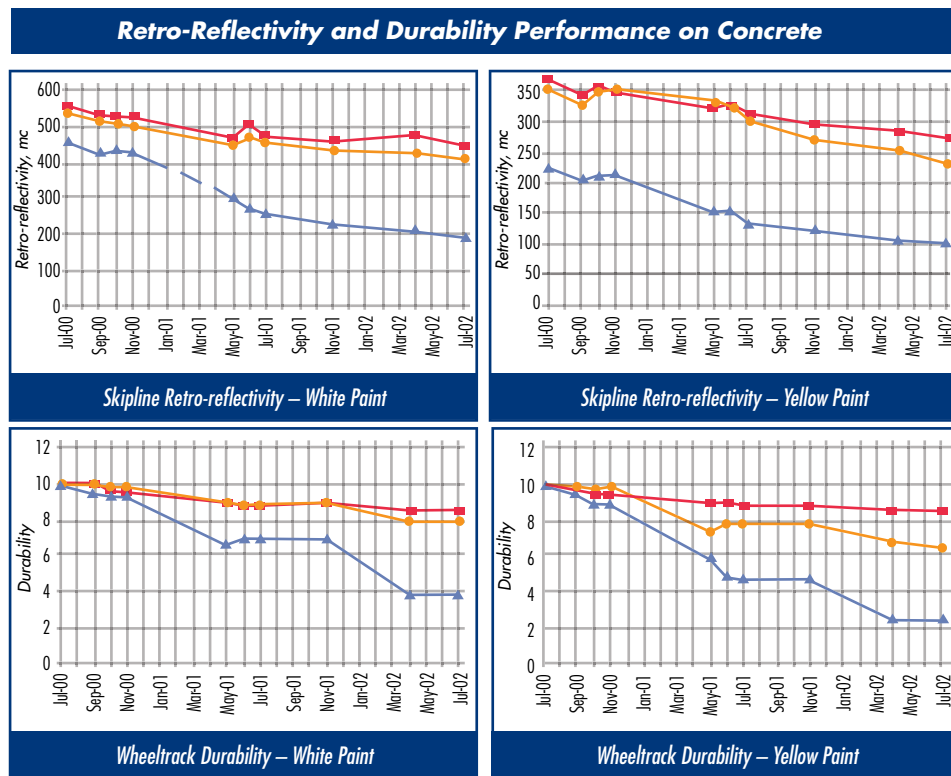


Figure 3

- ENCOR® DT 400 (30 mil) —■—
- Commercial H (30 mil) —●—
- 100% Acrylic (15 mil) —▲—

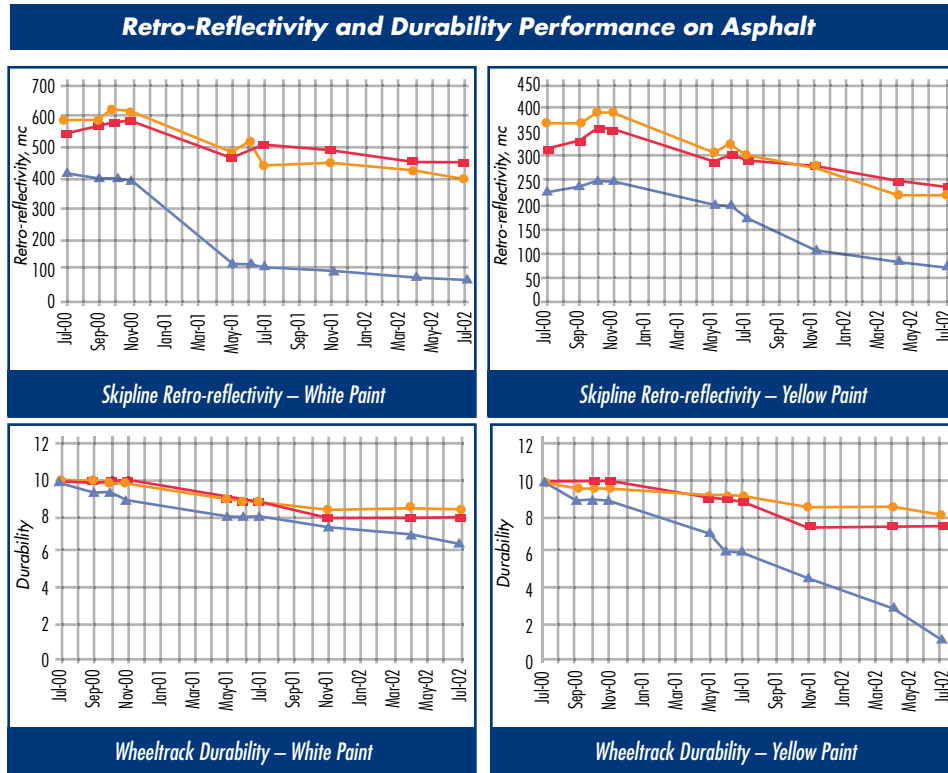


Figure 4

ENCOR® DT 400 (30 mil) — ■
 Commercial H (30 mil) — ●
 100% Acrylic (15 mil) — ▲

Application Considerations

Coning

ENCOR® DT 400 imparts excellent fast dry capabilities to markings applied at 22-30 mils, so unlike epoxies they rarely require coning. In fact, high-build markings formulated with ENCOR® DT 400 consistently pass the 60- to 90-second no-track test on NTPEP decks, even when applied at 30 mils.

However, as with any type of marking, adverse weather conditions may require line protection. **Figure 5** depicts the improved no-track performance of ENCOR® DT 400 compared to a selfcrosslinking traffic emulsion, "Commercial H." Both products were evaluated using procedure ASTM D 711.

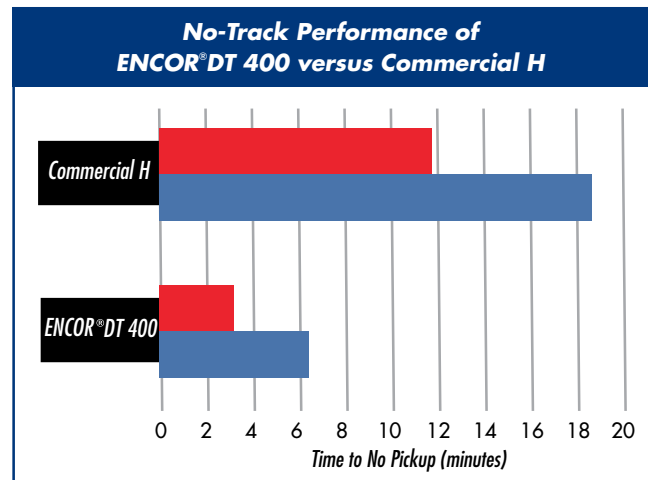


Figure 5

■ Methanol Containing
 (Formulation Suggestion V-2210)
 ■ Methanol Free
 (Formulation Suggestion V-2212)

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Surface Preparation

Like all traffic markings, high-build waterborne markings perform best when applied to a sound, clean substrate. But unlike epoxy and thermoplastic products that require removal by grinding, high-build waterborne markings can be successfully applied to existing thermoplastic, epoxy or paint markings if they are clean and well bonded.

Application Procedures

To properly apply a heavier line and placement of beads, a slight reduction in truck speed is recommended. To ensure proper line performance, paint thickness and beads must be applied at the specified rates.

Application in Adverse Weather

The outstanding early water resistance of ENCOR® DT 400 allows application in challenging weather conditions. **Figure 6** shows the results of a film wash-off test, which simulates rain on recently applied paint. During the test, 23 mil wet drawdowns of paints based on ENCOR® DT 400 and "Commercial H" (a self-crosslinking durable traffic emulsion)

were applied to a glass base and air-dried at 70% and 50% relative humidity for the time intervals shown. They were then subjected to running water at a flow rate of 1.3 gallons per minute for 5 minutes. As the results verify, traffic markings based on ENCOR® DT 400 demonstrate superior early water resistance.

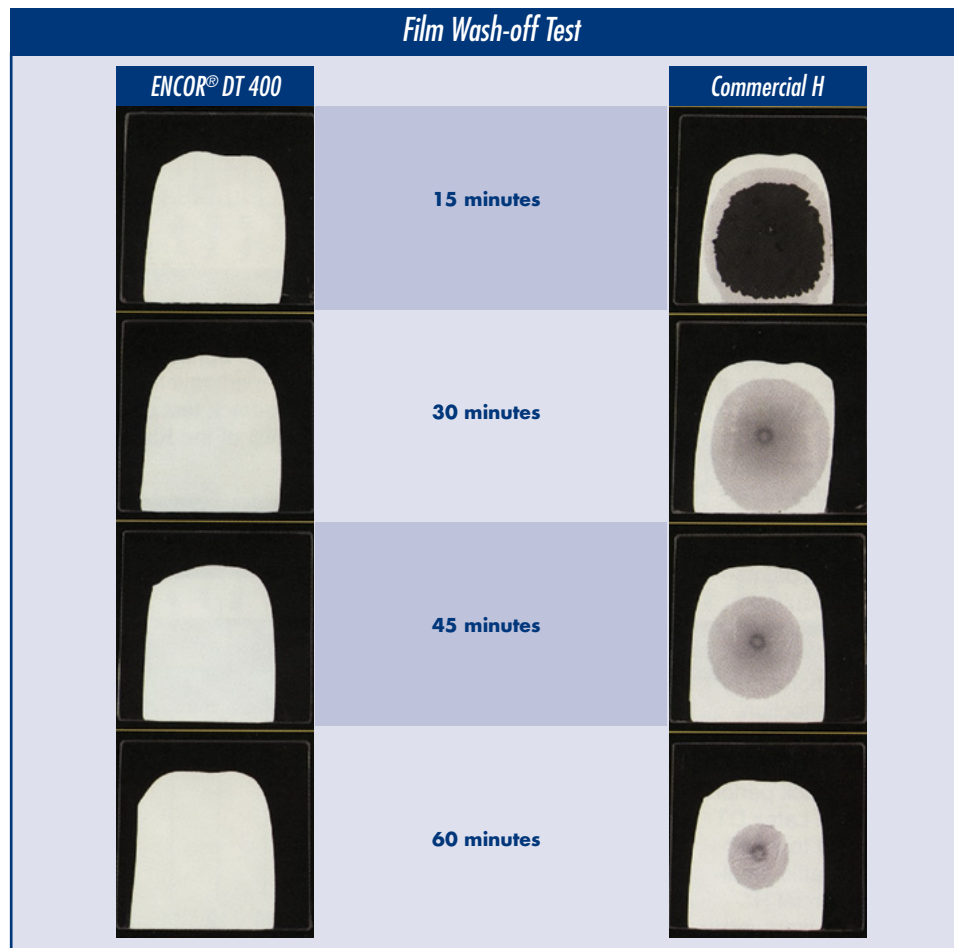


Figure 6
Drawdowns of 22-24 mil wet were tested at a water flow rate of 1.3 gallons per minute for 5 minutes. These paints were formulated to typical industry specifications and contain identical resin and pigment concentrations.

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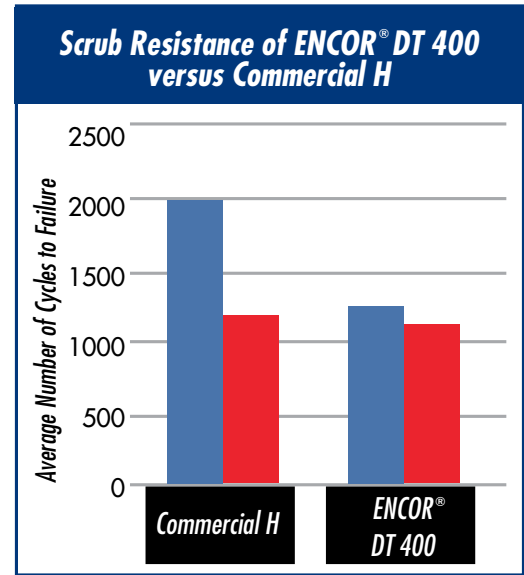
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ENCOR® DT 400 also exhibits outstanding scrub resistance performance because of its increased water-resistant nature and ability to bind the pigment particles efficiently within the paint film.

Figure 7 reveals the improved scrub resistance of ENCOR® DT 400 versus “Commercial H,” a selfcrosslinking traffic emulsion, in both methanol-containing and methanol-free formulations. Both latexes were substituted into the formulations on an equal volume solids basis.

Figure 7
■ Methanol Containing
 (Formulation Suggestive V-2210)
■ Methanol Free
 (Formulation Suggestive V-2212)



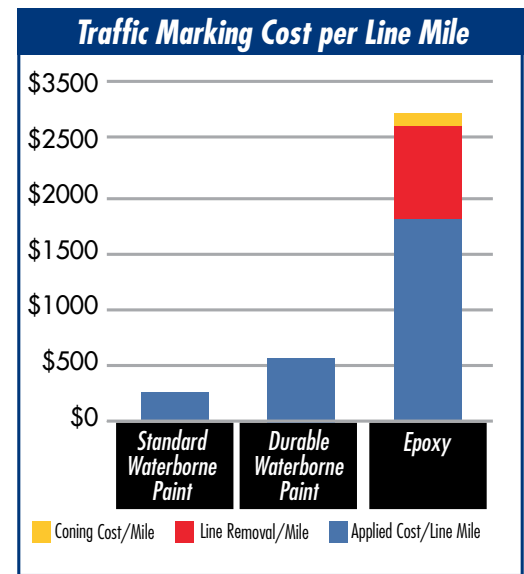
Cost Advantages and Performances

The average applied cost for high-build markings based on ENCOR® DT 400 with large beads is only \$0.10/ft, which is one third the typical cost of applied epoxy and thinline thermoplastic markings. The savings become even more substantial when compared to applications that require grinding to remove existing markings. Here, because high-build waterborne markings adhere to existing lines, grinding is not necessary. This can lower overall application costs to about one-fifth the cost of a typical removal and re-application project.

Figure 8 compares the cost per line mile for high-build markings based on ENCOR® DT 400 with standard traffic paint and epoxy markings.

A number of states in the U.S.A., including Texas, Louisiana, New Mexico, Nevada, Kansas, and Missouri, are now using high-build, durable traffic paint markings.

Figure 8



Line removal is not usually required with standard and durable paints.

A Methanol-Free Option

ENCOR® DT 400 is one of the only products that allow alcohol-free formulation of waterborne traffic markings. It can be formulated with or without methanol. Most waterborne traffic paints contain 2-3 percent methanol, which contributes to the overall VOC level of a formulation and can generate a measurable flash point in finished paints. When combined with other volatile solvents; methanol can also contribute to excessive paint skinning and nozzle plugging during warm weather. Methanol-free formulations may result in slightly longer dry times.

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Formulation Suggestions

Fast Dry White Traffic Paint with Methanol Formulation Suggestion V-2210

Ingredients	Lbs	Gallons
ENCOR® DT 400	460.0	52.87
DOWICIL* 75	0.5	0.04
Drewplus L-493	2.0	0.27
Rhodaline 226/35	7.4	0.70
Natrosol 250 HBR	0.3	0.03
Water	12.0	1.44
Ti-Pure R-900 <i>Mix for 3 minutes</i>	100.0	3.00
Omyacarb 5 <i>Mix for 4 minutes</i>	770.0	34.22
Methanol	30.0	4.52
Texanol	21.0	2.66
Drewplus L-493 <i>Mix for 3 minutes</i>	3.0	0.40
TOTAL	1406.2	100.16

Physical Properties

Pigment Volume Concentration (PVC), %	58.5
Weight per Gallon, lb	14.0
Total Solids, %	
by weight	79.0
by volume	63.5
VOC, g/L	85.7
Coalescent, %	9.0

Formulation Suggestions

Fast Dry Yellow Traffic Paint with Methanol Formulation Suggestion V-2211

Ingredients	Lbs	Gallons
ENCOR® DT 400	460.0	52.87
DOWICIL* 75	0.5	0.04
Drewplus L-493	2.0	0.27
Rhodaline 226/35	7.7	0.73
Natrosol 250 HBR	0.3	0.03
Water	13.0	1.56
1244 Sunglow Yellow	32.0	2.58
Ti-Pure R-900 <i>Mix for 3 minutes</i>	20.0	0.60
Omyacarb 5 <i>Mix for 4 minutes</i>	765.0	34.00
Methanol	30.0	4.52
Texanol	21.0	2.66
Drewplus L-493 <i>Mix for 3 minutes</i>	3.0	0.40
TOTAL	1354.5	100.26

Physical Properties

Pigment Volume Concentration (PVC), %	54.4
Weight per Gallon, lb	13.5
Total Solids, %	
by weight	78.1
by volume	63.4
VOC, g/L	85.8
Coalescent, %	9.0

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Formulation Suggestions

Methanol-Free White Traffic Paint Formulation Suggestion V-2214

Ingredients	Lbs	Gallons
ENCOR® DT 400	460.0	52.87
DOWICIL* 75	0.5	0.04
Drewplus L-493	2.0	0.27
Rhodaline 226/35	7.6	0.72
Propylene Glycol	20.0	2.31
Natrosol 250 HBR	0.3	0.03
Water	30.0	3.60
Ti-Pure R-900 <i>Mix for 3 minutes</i>	100.0	3.00
Omyacarb 5 <i>Mix for 4 minutes</i>	795.0	35.33
Texanol	21.0	2.66
Drewplus L-493 <i>Mix for 3 minutes</i>	3.0	0.40
TOTAL	1439.4	101.24

Physical Properties

Pigment Volume Concentration (PVC), %	59.2
Weight per Gallon, lb	14.2
Total Solids, %	
by weight	78.9
by volume	63.9
VOC, g/L	70.0
Coalescent, %	9.0

Formulation Suggestions

Methanol-Free Yellow Traffic Paint Formulation Suggestion V-2213

Ingredients	Lbs	Gallons
ENCOR® DT 400	460.0	52.87
DOWICIL* 75	0.5	0.04
Drewplus L-493	2.0	0.27
Rhodaline 226/35	7.7	0.73
Propylene Glycol	20.0	2.31
Natrosol 250 HBR	0.3	0.03
Water	30.0	3.60
1244 Sunglow Yellow	32.0	2.58
Ti-Pure R-900 <i>Mix for 3 minutes</i>	20.0	0.60
Omyacarb 5 <i>Mix for 4 minutes</i>	790.0	35.11
Texanol	21.0	2.66
Drewplus L-493 <i>Mix for 3 minutes</i>	3.0	0.40
TOTAL	1386.5	101.21

Physical Properties

Pigment Volume Concentration (PVC), %	55.2
Weight per Gallon, lb	13.7
Total Solids, %	
by weight	78.1
by volume	63.9
VOC, g/L	70.0
Coalescent, %	9.0

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Ask your traffic paint supplier about ENCOR® DT 400 and put your traffic paint formulations on the avenue to success. ENCOR® DT 400 will improve your high-build waterborne traffic markings and help you achieve your performance goals.

For more information about taking the high road with ENCOR® DT 400, visit our website at www.arkemacoatingresins.com or contact an Arkema representative.

<i>Comparative Performance Properties of ENCOR® DT 400 White and Yellow Traffic Paints</i>				
	<i>White</i>		<i>Yellow</i>	
	Methanol	Methanol-Free	Methanol	Methanol-Free
Stormer Viscosity KU				
Initial	87	87	86	86
24-hr	87	88	86	87
Weight per Gallon, lb	13.85	14.27	13.45	13.15
No-Tracking Time, min 50% R.H. 72° F	4.5	6.8	5.2	6.9
CIE Color				
x	0.3182	0.3189	0.5025	0.5021
y	0.3375	0.3386	0.4387	0.4398
Reflectance	86.57	85	52.36	52.34

Table 1

* 15-mil wet film

* 5-mil wet film

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Product Safety

Before handling the materials listed in this bulletin, read and understand the product MSDS (Material Safety Data Sheet) for additional information on personal protective equipment and for safety, health and environmental information. For environmental, safety and toxicological information, contact our Customer Service Department at 1-866-837-5532 to find an MSDS, or visit our web site: www.arkemacoatingresins.com

No chemical should be used as or in a food, drug, medical device, or cosmetic, or in a product or process in which it may contact a food, drug, medical device, or cosmetic until the user has determined the suitability and legality of the use. Since government regulations and use conditions are subject to change, it is the user's responsibility to determine that this information is appropriate and suitable under current, applicable laws and regulations.

Arkema Coating Resins requests that the customer read, understand, and comply with the information contained in this publication and the current MSDS(s). The customer should furnish the information in this publication to its employees, contractors, and customers, or any other users of the product(s), and request that they do the same.

Storage and Handling

Follow procedures typically recommended for polymer dispersions. Use corrosion-resistant storage tanks and piping. Air-operated diaphragm pumps are preferred. Avoid temperature extremes. Do not freeze; store between 4-40°C.



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