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Dynamic KEMA 300 Epoxy Pipeline Coating

Construction Related Services, (CRS), is pleased to advise the availability of the world's first liquid epoxy coating to successfully compete with fusion bond epoxy powder (FBE) as a mainline coating.

KEMA 300 are solvent-free, liquid epoxy coatings that use unique polymer chains to achieve near-chemical adhesion. In addition, KEMA 300 affords a remarkable operating temperature window that now opens single-layer-coating service from below zero to 149°C, in immersion service. It will protect metal substrates against corrosion at high temperatures without sacrificing coating film flexibility. This is achieved beginning with a dry film thickness of 355 *ums* or 14 mils up to 762 *ums* or 30 mils.

KEMA 300 epoxy can eliminate the need for two or even three layer coatings, its abrasion resistance results and edge retentive characteristics now make it the best protective coating for both directional drill and road boring applications. When fully cured it is near impervious to damage. KEMA 300 can also be applied to 'sweating' pipe surfaces where it successfully cures to exhibit an excellent bond to the metal substrate.

As a certified application contractor, CRS believes KEMA 300 is a versatile and more reliable pipeline coating that can be used in applications where FBE performance is uncertain.

Kema Coatings Limited

Product Data Sheet:

Kema 300PA

100% SOLID EPOXY COATING-BRUSH/SPRAY GRADE

05.10.01

Features: Solvent-free. Superior Chemical resistance, excellent high temperature, abrasion and impact resistance. Single coat application.

Typical Uses: Exterior and interior of piping and storage tanks. Steel or concrete.

Test Results:

Adhesion (CSA Z245.20-98. Clause 12.14)

ASTM D570 Modified

Duration/ Temperature	Rating (1-5)	DFT (mils)
28 day,65C	1	16-28
28 day,80C	1	20-27
28 day,95C	1	19-25

Cathodic Disbondment (CSA Z245.20-98. Clause 12.8. @1.5V) ASTM G8 Modified

Duration/ Temperature	Average Radius (mm)	DFT (mils)
28 day,80C	6	22-28
28 day,95C	5	23-27
28 day,115C	4	16-24

Impact Resistance (CSA Z245.20-98. Clause 12.12. Holiday test voltage 2.5 kV) ASTM G14-88(1996)e1

Temperature	Impact Energy (Joules/In-Lbs.)	Pass Yes/No	DFT (mils)
-40C.	2 joules	Yes	24
-30C.	1.5 joules	Yes	18
+20C.	3.5 joules	Yes	20

Flexibility (CSA Z245.20-M98. Clause 12.11)

ASTM D522-93a Modified

Temperature	Bend	Rating	DFT (mils)
-30C/-22F	3.0ppd	Pass	10
-30C/-22F	2.5ppd	Pass	10
0C.32F.	1.0ppd	Pass	23
20C./72	1.5ppd	Pass	24
50C./113	1.5ppd	Pass	30

Hardness:

ASTM D2240-86. 85 (+/-3)

Abrasion Resistance:

ASTM D4060-95. 60mg. (+/-5)

Service Temperature:

Exposure **Max. Temp.**
 Dry Service 232°C. (450°F.)
 Spills, Splashes 182°C. (360°F.)
 Immersion Service* 149°C. (300°F.)

**For immersion in solvents, mineral acids or alkaline solutions over 66°C: 150°F, please consult Kema Coatings.*

Mixing Ratio:

3:1: Part A:B

Specific Gravity:

ASTM D1475 Base:1.72; Hardener: 0.964;
 Combined: 1.306

Viscosity: (@25C.)

ASTM D1084 Base: 32,000cps;
 Hardener: 3200cps;
 Combined:17,550cps;

Weight:

A+B: 13.015 lbs/usg

Flash Point (min.):

>121°C. (250°F)

VOC Content:

0 (Zero) grams/litre

Gel Time:

@ 5 mils., 18secs@160C.
 @25 mils., 45mins@24C.

Pot Life:

45 minutes @ 25C.

Color:

Dark Blue (Mixed)

Recommended Thickness: *Exterior:* Below grade: 18 mils. minimum. Above grade: 10 mils. minimum. Heavier for severe chemical service. *Interior:* Consult Kema Coatings for lining recommendations. Post-cure may be required.

Packaging: *Spray Grade:* 50 USG drums and 5 USG pails. *Brush Grade:* 1.5 litre kits/4 to a case

Shelf Life: 12 months from date of shipment when stored unopened in original container.

Chemical Resistance:

Ammonium Hydroxide
Ammonium Sulphate
Aromatic & Aliphatic Solvents
Barium Carbonate
Black Liquor
Butyl Acetate

Butyl Carbitol
Chlorinated Solvents (except Methylene Chloride)
Chlorinated Wax
Chloride Salts
Copper Cyanide
Dipropylene Glycol
Ferrous Nitrate
Hydrochloric Acid up to 100%
(37% hydrogen chloride content)

Hydrogen Sulfide
(Many) Organic Acids
Sodium & Potassium Phosphate

Phosphoric Acid up to 90%
Potassium Hydroxide
Red Liquor

Silver Nitrate
Sodium Hydroxide up to 50%
Sodium Cyanide
Sodium Ferro Nitrate
Sulfides

Sulfuric Acid up to 98%
Zinc Nitrate
white Liquor

Preparation: Metal: Remove all oil, grease or scale from the surface. Test for chlorides - less than 5 ppm is acceptable. Use a non-spherical blast medium to give a 2-3 mil (50-75 micron) profile to achieve these surface preparation standards or their equivalents:

Non-chemical Service: SSPC-SP6 Commercial Blast (NACE 3): *Intermittent Splash or Wear:* SSPC- SP 10
Near White Metal Blast (NACE 2): *Immersion or Abrasive Service:* SSPC-SP5 White Metal Blast (NACE 1).

Application: Kema 300PA may be sprayed, brushed, rolled or applied by squeegee. Use a medium bristle brush or non-shed roller (3/8" nap or shorter) designed for use with epoxies. To spray Kema 300PA, use plural component equipment as manufactured by GRACO with the following specifications as a guideline:

Pump: (GRACO)	
Ratio	43.1 or greater
In-Line Filter:	60 mesh
Tip Size:	19-27
Product Hose:	Maximum 150 feet

PreHeat Temperature:

Part A: 160F. maximum
Part B: 160F. maximum
Hose Assembly: 180F. maximum

Mixing Tube: 09" minimum

Multiple Coats: Second and subsequent coats must be applied before the previous coat has completely cross-linked: Apply additional coats only up to the time when the previous coat will depress under your touch but will not leave any coating residue on the finger. If too hard you must wait, re-blast and then recoat.

The same requirement applies when overlapping the seams of adjacent coating sections to create a continuous protective film. If the coating surface to be overlapped at the seam cannot be brush blasted, use a non-impact means such as power-brushing or sanding to create a mechanical profile.

Cure Time (at 21°C./ 70°F)

Re-coat Window	Up to 4 hours
Light Loading	12 hours
Immersion (Aqueous Service)	48 hours
Full or Chemical Service	7 days

Forced Curing: The cure time varies with temperature variations. If speed is desired, cure time can be reduced and product performance enhanced by artificially applying heat during the curing process. A temperature of 66°C. (150°F) for 2 hours is recommended for off-line speed curing before placing the coating into full service.
(Consult with Kema Coatings).

Clean-Up: Use a mixture of MIBK and Butyl acetate (50/50) or MEK for clean-up. Read the Material Safety Data Sheets for any of these products (flammable liquids) before using them. Skin can be cleaned with denatured alcohol, preferably ethanol.

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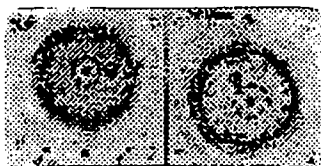
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Coating Manufacturer Hits Home Run

Invents KEMA™ 300 Liquid Epoxy

Kema Coatings Limited has succeeded in developing a tough epoxy coating that exhibits *virtually no disbondment* over an ever-widening range of operating temperatures.

This result has been verified during three separate trial programs conducted at a independent test facility. Test temperatures ranged between 65°C./149°F. and 115°C./239°F.



Avg. 4mm. radius/disbondment at 115°C/28d.

Accepted Canadian Standards Association (CSA) Z245.20-98. clause 12.8 @ -1.5V. FBE test methods were used with minor modifications to allow for temperature extremes.

The new epoxy coating, christened KEMA 300, demonstrates much less than usual disbondment at lower temperatures than all other thermoset polymer coatings evaluated. And, at elevated temperatures, virtually no disbondment of the KEMA™300 epoxy is witnessed.

This performance continues, in regular immersion, up to and including 149°C./ 300°F. after which the epoxy film goes through its next transformational stage and again begins to exhibit disbondment rates similar to those results found at the low temperatures.

All cathodic disbondment test panels were coated with KEMA 300 film each measuring from 16 mils/ 406.4 ums - 36 mils/ 914.4 ums thick.

This new coating is tough! It easily passed impact tests (CSA Z245 20-98 Clause 12.12) at very low temperatures between 0°C. and -30°C

An Offer You Should Not Refuse

New Epoxy Coating Available at No Charge

- ✓ Do you have a immediate need for a better performing coating at high temperature?
- ✓ Do you have a need for better performing coatings at ambient temperatures?
- ✓ Are you looking for a liquid coating that is tough and offers improved resistance to impact and abrasion?
- ✓ Are you searching for a liquid coating that strongly resists a wide range of chemical solutions?
- ✓ Are your coating protection needs both external and internal?
- ✓ Do you have a project waiting for the right coating?

> Cathodic Disbondment (CSA Z245.20-98 Clause 12.8 @1.5V)

Duration/ Temperature	Average Radius (mm)	Coating Thickness (mils)
14 day, 80C	5	25-29
28 day, 80C	6	22-28
14 day, 95C	5	13-20
28 day, 95C	5	23-27
28 day, 115C	3	21-36
28 day, 115C	4	16-24



Average 6mm. radius/disbondment at 80°C/28d

Testing Results

Adhesion (CSA Z245.20-98, Clause 12.14)

Duration/ Temperature	Rating (1-5)	Coating Thickness (mils)
14 day, 65C	1	22-32
28 day, 65C	1	16-28
14 day, 80C	1	17-26
28 day, 80C	1	20-27
28 day, 95C	1	19-25

Impact Resistance (CSA Z245.20-98, Clause 12.12)

Holiday test voltage 2.5 kV)

Temperature	Impact Energy (Joules/in.-lbs.)	Pass (Yes/No)	Coating Thickness (mils)
0C	1.5/13.3	Yes	20-22
0C	2.0/17.7	Yes	25-29
-30C	1.5/13.3	Yes	25-26

You Be The Judge

To help you to better understand the importance of the KEMA 300 discovery we publish failure rates of some of our competitors from test results dated January 1996.

Coating	Disbondment radius at 21°C/70 F (mm)		Disbondment radius at Elevated Temperature (mm)
	Blasted	Temp.	
Enviroline 394FS	4	33	90°C/194°F
Portal 7000	6	22	65°C/149°F
SP3888	3	23	90°C/194°F
Valpipe 500	5	45	90°C/194°F
Canusa GTS65	0	32	65°C/149°F
Raychem HLTP80	3	18	80°C/176°F
Raychem WPC100M	8	16	80°C/176°F

Kema Coatings Limited

Product Data Sheet:

Kema 400

EPOXY TANK LINING - SPRAY GRADE

10.19.99

Features: 100 % solid. Superior chemical resistance, excellent high temperature, and wear resistance, good abrasion resistance.

Typical Uses: Interior of piping and storage tanks.

Test Results:

Adhesion (CSA Z245.20-98. Clause 12.14)

Duration/ Temperature	Rating (1-5)	Coating Thickness (mils)
14 day,65C	1	22-28
28 day,65C	1	16-28
14 day,80C	1	17-26
28 day,80C	1	20-27
28 day,95C	1	19-25

Cathodic Disbondment (CSA Z245.20-98. Clause 12.8. @1.5V)

Duration/ Temperature	Average Radius (mm)	Coating Thickness (mils)
14 day,80C	5	25-29
28 day,80C	6	22-28
14 day,95C	5	13-20
28 day,95C	5	23-27
28 day,115C	3	21-36
28 day,115C	4	16-24

Impact Resistance (CSA Z245.20-98. Clause 12.12. Holiday test voltage 2.5 kV)

Temperature	Impact Energy (Joules/in.-lbs.)	Pass (Yes/No)	Coating Thickness (mils)
0C	1.5/13.3	Yes	20-22
0C	2.0/17.7	Yes	25-29
-30C	1.5/13.3	Yes	25-26

Service Temperature:

Exposure	Max. Temp.
Dry Service	232°C. (450°F.)
Spills, Splashes	182°C. (360°F.)
Immersion Service*	149°C. (300°F.)

*For immersion in solvents, mineral acids or alkaline solutions over 66°C: 150°F, please consult Kemacoat International Inc.

Specific Gravity: Resin 1.51 Hardener 0.95
Weight: 11.0lbs/USG

Flash Point (min.): >121°C. (250°F)
VOC Content: 0 (Zero) grams/litre

Coefficient of Thermal Expansion: 1.8

Color: Light Blue

Recommended Thickness: *Below grade:* 20 mils. minimum. *Above grade:* 10 mils. minimum. Heavier for very severe chemical service.

Packaging: *Spray Grade:* 50 USG drums and 5 USG pails.

Shelf Life: 12 months from date of shipment when stored unopened in original container

Pot Life:	Ambient Temp.	Time
	4°C. (40°F.)	5 hours, 40 mins.
	24°C. (75°F.)	1 hour
	33°C. (92°F.)	25 minutes

Chemical Resistance:

Ammonium Hydroxide
Aromatic & Aliphatic Solvents
Black Liquor
Butyl Acetate
Butyl Carbitol

Chlorinated Solvents (except Methylene Chloride)
Chlorides
Hydrochloric Acid up to 100%
(38% hydrogen chloride content)
Hydrofluoric Acid up to 40%

Chemical Resistance (cont'd)

Hydrogen Sulfide
 MEK
 Nitric Acid up to 30%
 (Many) Organic Acids
 Phosphates

Phosphoric Acid up to 100%
 Potassium Hydroxide
 Salts
 Sodium Hydroxide up to 50%
 Sulfides

Sulfuric Acid up to 98%
 White Liquor

Preparation: Metal: Remove all oil, grease or scale from the surface then blast with sharp grit to finish. Use a non-spherical blast medium to give a 2-3 mil (50-75 micron) profile to achieve the following surface preparation standards or their equivalents:

Non-chemical Service: SSPC-SP6 Commercial Blast (NACE 3); *Intermittent Splash or Wear:* SSPC- SP 10 Near White Metal Blast (NACE 2); *Immersion or Abrasive Service:* SSPC-SP5 White Metal Blast (NACE 1).

Application: Kema 400 may be sprayed, brushed, rolled or applied by squeegee. Use a medium bristle brush or non-shed roller (3/8" nap or shorter) designed for use with epoxies. To spray Kema 400, use an airless system such as those available from GRACO, with the the following specifications as a guideline:

Pump:
 Ratio 43:1 or greater
 Minimum Output 4000 psi

In-Line Filter: 30 mesh
Tip Size: .020 - .034 inch

Product Hose:
 Minimum - Optimum I.D. 0.37 - 0.5 inch
 Maximum Length 70 feet

Multiple Coats: Second and subsequent coats must be applied before the previous coat has completely cross-linked. Apply additional coats when the previous coat will still string out (pigtail) and hold its shape when touched. If any slight tack remains, allow the product to cure, then brush blast before applying the next coat.

The same requirement applies when overlapping the seams of adjacent coating sections to create a continuous protective film. If the coating surface to be overlapped at the seam cannot be brush blasted, use a non-impact means such as power-brushing or sanding to create a mechanical profile.

Cure Time (at 21°C./ 70°F)

Re-coat Window	1 to 1 ½ hours
Light Loading	12 hours
Immersion (Aqueous Service)	30 hours
Full or Chemical Service	7 days

Speed Curing: The cure time varies with temperature variations. If speed is desired, cure time can be reduced and product performance enhanced by artificially applying heat during the curing process. A temperature of 66°C. (150°F) for 2 hours is recommended for speed curing before placing the coating into full service.

Clean-Up: Use a mixture of MIBK and Butyl acetate (50/50) or MEK for clean-up. Read the Material Safety Data Sheets for any of these products (flammable liquids) before using them. Skin can be cleaned with denatured alcohol, preferably ethanol.

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