KEMA Coatings Ltd.

Version 03.13.08. Replaces all prior.

MODULE SEALANTS

MACRO-POLYISOBUTYLENE

PRODUCT DATA SHEET

Description

KEMA Module Sealants are safe, easy-to-use, long lasting, corrosion-resistant, barrier coatings.

They are packaged in roll form and can be either wrapped onto the pipe, fitting and assembly or cut into strips for flat application to a clean substrate.

The aggressive bond of the adhesive is a result of the proprietary macro-polyisobutylene formulation that is further improved with the addition of special raw material enhancements.

The finished elastomeric adhesive compound exhibits very high tensile strength and a strong resistance to both cold flow and shear.

All Module Sealants are UV-resistant and well-suited for both above and below grade installations.

They are immune to the attack of anaerobic bacteria commonly found in soils worldwide and do not breakdown even after lengthy immersion.

KEMA Module Sealants offer the user a barrier coating that is resistant to a wide range of acid and alkali solutions as well as gases.

They are offered as either sealants or tapes in a variety of roll lengths, widths and thicknesses. The tapes are completed with a polyethylene (PE) film bonded to one side. The PE film is currently available in 5 mils.(127*ums)* or 12 mils.(304.8*ums*) film thicknesses.

KEMA Module Sealants are at work in the ice and snow of the Canadian North; the dry deserts of the Middle East and in the moist, humid coastal regions of Africa.

Characteristics

Colour:	Black
V.O.C. Content:	0 (Zero)
Viscosity:	99% solid.
Flash Point (min.):	204^{o}C. (400^{o}F.)
Specific Gravity:	1.1 @ 25^{o}C.(77^{o}F.)
Shelf Life:	36 months, unopened. Store indoors at 5^{0}C-38^{0}C./ 41^{0}F.-100^{0}F.
Interleaf:	Comprised of treated paper that is 1/2in./12.7mm. wider than the tape wrap it protects. Biodegradable.

***Primer*:** **The use of a pre-approved liquid primer is recommended on all *bare* metal surfaces only. Contact KEMA Coatings Limited.**

Some Recommended Uses

Use as protection (new or maintenance coating) on prepared and primed steel, iron, aluminium, concrete and asphalt substrates. For example:

- Thermite Welds on Pipelines & Tanks
- Pipeline Girth Welds
- Stainless Steel Band Weld Coating
- Pipeline Rehab. Coating Transitions
- General Pipeline Coating Repair
- Tie-Ins
- New Pipeline Coating
- Temporary Highway Island Transitions
- Asphalt/Concrete Crack/Gap Repairs
- Adhesive Strips for Plastic Film Bonding
- Insulated Spacers

Fig.1. Module Sealants in Roll Form

Standard Sizes and Part Numbers

Item	Description	Part No.
	250mils./ 6.4mm. thick sealant	
KEMA 250	4in./10cm.wide	752GHA760
KEMA 250	6in./15cm. wide	752GHE760
KEMA 250-12	4in./10cm. wide c/w 12mils./304.8*ums* PE film on 1 side.	752GHA1760
KEMA 250-12	6in./15cm. wide c/w 12mils./304.8*ums* PE film on 1 side.	752GHE1760
	60mils/1.5mm. thick sealant	
KEMA Series 60	4in./10cm. wide	752GGA0760
KEMA Series 60	6in./15cm. wide	752GGF0760
KEMA Series 60	4in./10cm. wide c/w 5mils./127*ums* PE film 1 side.	752GGA1760
KEMA Series 60	6in./15cm. wide c/w 5mils./127*ums* PE film 1 side.	752GGF1760

Physical Properties

Dielectric Breakdown Voltage: ASTM D149-97a (2004)	>20,000V. Wet >10,000V. Dry
Peel Adhesion: CSA Z245.21 M98 Clause 12.4	22.7 N.
Cathodic Disbondment: CSA Z245.21 M98 Clause 12.3	(0). Zero.
Impact Resistance: CSA Z245.20 M98 Clause 12.12	7.75J.
Hardness: (Shore A)	30 maximum.
Adhesion to Primed Steel:	**>**1975 psi
Flexibility:	Excellent
Pliability:	Very Good

Chemical Resistance

1. Aqueous inorganic salts
2. Mineral acids including hydrofluoric
3. Sulfuric, phosphoric and mixed acids
4. Alkalis

Service Temperature Ranges

ASTM D1000

Above Grade Service -	-29^{0}C.- 121^{0}C. -20^{0}F.- 249^{0}F.
Below Grade Service -	-29^{0}C.- 90^{0}C. -20^{0}F.- 194^{0}F.
Application -	- 7^{0}C.- 49^{0}C. -19^{0}F.- 120^{0}F.

Compatibility

Both the KEMA 250-12 w/PE film and the KEMA Series 60 w/PE film can be used as topcoats over the KEMA 250 and the KEMA Series 60 sealants. Can also be used on all prepared metal surfaces. Aggressively bonds to itself, coal tar, asphalt, urethane, polyethylene, polypropylene, tapes, fusion bond epoxy and liquid epoxy coated surfaces. Please contact us if your existing coating is not mentioned here.

Table 1. Packaging

SIZE	4”	4”w/PE	6”	6”w/PE
ITEM				
250	4 Rolls 4x20ft. 1 Carton		4 Rolls 4x20ft. 1 Carton	
250-12		4 Rolls 4x20ft. 1Carton		4 Rolls 4x20ft. 1 Carton
Series 60	6 Rolls 6x50ft. 1 Carton	6 Rolls 6x50ft. 1 Carton	4 Rolls 4x50ft. 1 Carton	4 Rolls 4x50ft. 1 Carton

Cold Flow Test Protocol and Results

Cold flow and adhesion tests of KEMA Module Sealant coatings were completed in 1994. Testing was conducted in the following manner:

1. A soil box was constructed.
2. The soil box cycled between wet and dry during a 28 day test period.

3. The soil box operated at two temperatures - 40^0C./104^0F. for the first 14 days then at 55^0C./131^0F. for the remaining 14 days.
4. Insulated copper wire leads were thermite welded to carbon steel test panels in accordance with industry practice.

5. Each welded panel was cleaned and primed then allowed to dry.
6. Pre-cut strips of KEMA 250-12 Module Sealant were applied to each primed and cured panel with one strip overlapping the next until the panels were completely coated.

7. White indelible ink markers were used to highlight each overlap of the Module Sealant strips. (See Figure 2.).
8. Completed panels were buried in soil box.

9. Soil boxes were top-weighted to simulate real-time loads experienced on buried pipelines.
10. 28 days later the test panels were removed, allowed to dry and the Module Sealant overlap seams were observed for movement. (See Figure 3.).

Results:

(1) No material cold flow was observed.
(2) No loss of adhesion was observed.
(3) No cracks or “tenting” was observed.

Figure 2. Pre-Test

White indelible ink lines are used to define material starting positions.

Figure 3. Post-Test

White ink marks remain in place proving that material maintains its original position after 28 days of destructive testing.

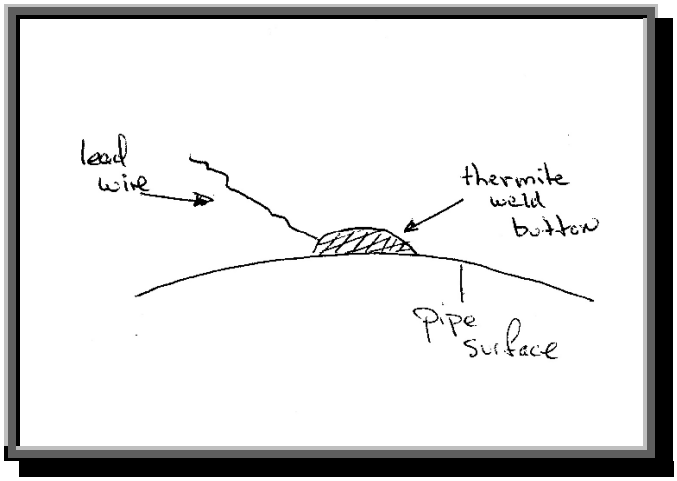
APPLICATION BULLETIN NO.1 - KEMA MODULE SEALANTS

COATING and PAINTING SPECIFICATIONS

THERMITE WELD PROTECTION COLD APPLIED MODULE SEALANT <KEMA 250>+<KEMA 250-12>

Rationale:

At the spot where a lead wire is thermite welded to a steel pipe (a common practice for cathodic protection systems on buried pipelines) a weld "button" is produced.



The button rises up from the steel pipe surface to create a relatively sharp *load* point that on average measures 1/2inch/12.7mm. in height and between 1inch/25.4mm. – 2inch/50.mm. in diameter.

Figure 1-1. A trainee fastens a lead wire to a steel pipe with a thermite weld(er).

Over the years the pipeline industry has chosen to use a variety of corrosion-resistant, barrier coatings to protect these weld button sites. Typical coatings have included polyethylene, PVC and petrolatum tapes, heat shrink sleeves, liquid epoxies and pre-formed, mastic-filled caps.

Follow-up investigative digs of lead wire installation sites have shown that these types of barrier coatings have actually contributed to the rapid corrosion failures subsequently found at these locations.

This is thought to be a result of the coating prematurely thinning out across the top of the weld button site largely due to isolated soil loads. This has contributed to a general loss of adhesion within the thermite weld surface area.

Figure 1-2. The above photo illustrates how one competitor's coating can emphasize an already weakened coating on a weld "load" point

Further research has concluded that the back and forth, twisting movement of newly buried pipe along with the repetitive wet-to-dry-to-wet cycles of the surrounding soils produce a "suction" effect that acts upon the coating to dislodge it from the weld area and to expose the underlying metal surface to active corrosion.

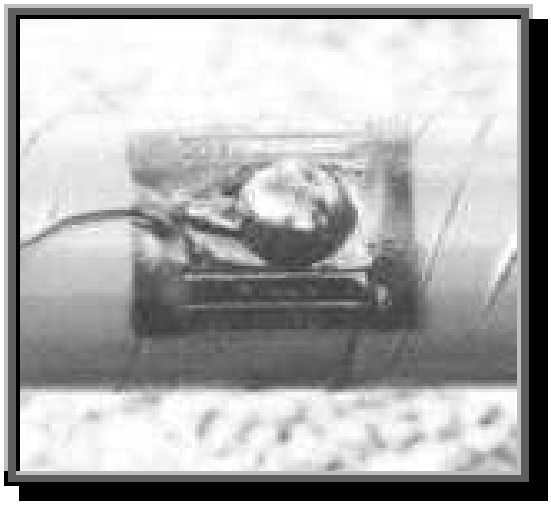


Figure 1-3. Another example of a competitor's patch-style coating used to protect the finished thermite weld button area.

The KEMA Solution

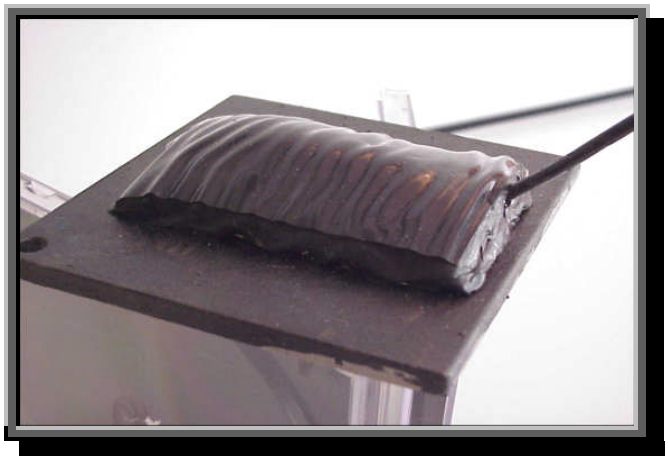


Figure 1-4. Thermite weld coated with the KEMA 250-12 Module Sealant system.

The KEMA 250-12 thermite weld coating system is designed to compensate for the inherent weaknesses of traditional field coatings when they are used to coat and protect weld sites.

As Figure 1-4 shows the applied KEMA 250-12 system builds to the top of the weld button and extends across a much larger surface area than other coatings. This works to eliminate any potential for the coating system to thin out and flow when subjected to the constant soil pressures.
Its aggressive macro-polyisobutylene adhesive creates a much stronger bond to both the steel and mainline coating substrate when compared to competitive coating choices while its unique material structure affords the KEMA 250-12 protected site an extremely durable, resistant coating that stands up like new over time.

Thermite weld drain lead installations that attach more than a single wire at each location are assured of even greater protection due to the much larger pipe surface area that is coated with the KEMA 250-12 coating system.

THERMITE WELD COATING INSTRUCTIONS

1. For all thermite weld repairs and new installations ensure the entire area affected by the thermite weld is clean.

2. Remove all subsequent weld splatter and sharp metal protrusions with a file.

3. Cover all bare metal including the thermite weld button with the pre-approved and specified primer.

4. The primer should also be applied over any existing coating with a 2in./50mm. overlap.

5. Allow primer, Part# **KEMA PG600** to dry before applying the **KEMA 250 module sealant, Part #752GHA760.**

6. FOR TEST LEAD CONNECTIONS

i)Prime the area with **PG600** primer where the thermite weld has been applied, including any exposed wire and the thermite weld button, The primer should also overlap the existing coating by 2in./50mm. Allow the primer to completely dry before applying the **KEMA 250 module sealant, Part #752GHA760**.

ii)Cut the 250mm thick (sticky two sides) **KEMA 250** module sealant into lengths long enough to cover the exposed metal pipe and allow for a further 50mm. overlap onto the existing mainline coating.

iii) For each thermite weld connection lift the wire slightly to allow the **KEMA 250** to be placed onto the metal substrate and underneath the wire. Cut a slit in the mastic so it can pass around the wire.

iv) For the first piece, pass the **KEMA 250** from the side under the wire and mold it around the thermite weld button. Press it down firmly to ensure perfect adhesion is achieved. For the second piece, pass it from the thermite weld side over the button until it overlaps the first piece of the mastic and the thermite weld button and wire. Press down firmly. This is considered to be the base layer.

v) Add additional **KEMA 250** to ensure the module sealant overlaps the exposed portion of the pipe that has been affected by the thermite weld by 100mm.

vi) Press the test lead wire firmly into the sealant.

vii) Repeat steps (i) to (iv) with the **KEMA 250-12** PE-backed module sealant **(Part# 752GHA1760).** Mold around the test lead wire and press down firmly.

viii) A length of the test lead wire should be laid along the top of the installed pipe and secured in place at least at two extra locations with strips of **KEMA 250-12** to secure it during backfilling operations.

7. FOR DRAIN LEAD CONNECTIONS

i) After thorough cleaning, coat the full square area with **PG600** primer where thermite weld has been applied including any exposed wire and the thermite weld button. The primer should also overlap the existing coating by 50mm. Allow the primer to completely dry before applying the **KEMA 250.**

(ii) Cut the 250mm thick **KEMA 250** in lengths long enough to cover the exposed steel pipe and allow for a 50mm overlap onto the existing coating.

(iii) Prior to applying the **KEMA 250** lift the wires near the thermite weld button slightly so the sealant can be applied under the wires. For the first piece, cut slits in the sealant so the sealant may pass though the wire when it is applied. From the wire side of the drain lead splice kit, pass the sealant under and through the wire and then mold around thermite weld button. For the second piece cut a single slit in the middle. Pass the piece over the first piece of sealant and slide it under and through the wire connected to the single weld at the 12 o'clock position. This piece should have a 25mm overlap onto the first piece. Press the sealant down firmly and mold it under the wire and around the thermite weld button.

(iv) Lay the balance of the **KEMA 250** continuing with the 50mm overlap onto the existing coating providing a 25mm overlap on each piece until the exposed area is covered. Press the sealant down firmly to ensure good adhesion. This is considered as the base layer.

(v) Fold thermite weld wires back and onto sealant and press the thermite weld wires firmly into the base sealant.

(vi) Cut the 262mm thick **KEMA 250-12** into lengths sufficient to cover the desired area and repeat step (i)-(iv) and offset the overlap on each piece so as not to allow the overlap on the base layer to be in the same place. Press the **KEMA 250-12** down firmly to provide good adhesion. This is considered the top finish layer.

(vii)The drain lead splice is now ready to be spliced into the main drain lead cable to the rectifier.

Note: Prior to connection to the main drain lead cable, the main cable should be secured to the top of the installed pipe with extra lengths of **KEMA 250-12** at least at two extra locations before splicing into the drain lead splice kit.

8. BACKFILLING

(i) Make sure that the orientation of the wire is such that the connection will not be subjected to any tension or stress as a consequence of backfilling.

(ii)Hand shade the coated connection with about 150mm of clean selected backfill prior to the main backfilling operation.

THE END 05.22.07

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APPLICATION BULLETIN NO.2 - KEMA MODULE SEALANTS

COATING and PAINTING SPECIFICATIONS

FIELD COATING SYSTEM
COLD APPLIED MODULE SEALANT - <KEMA SERIES 60>

Figure 2-1. Remove Old Coating.

Figure 2-2. Minimum Power Tool Clean.

Figure 2-3. Apply Liquid Primer.

Figure 2-4. Let Primer Dry. Apply KEMA Series 60.

Figure 2-5. Visually Inspect Tape Wrap Installation. Remove Excess Wrinkling and Air Pockets. Recoat.

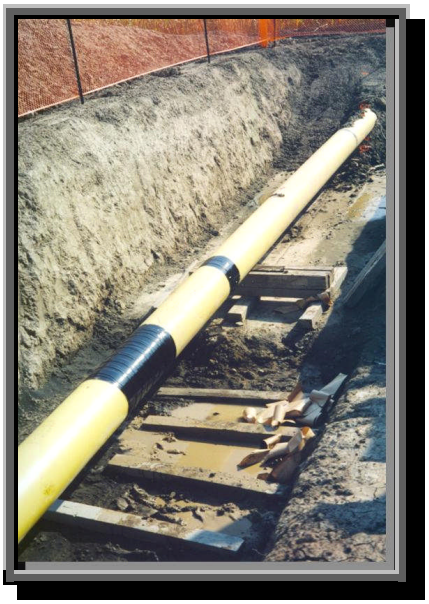

Figure 2-6. New Wrap is Ready for Spark Testing.

1.0 SCOPE

This specification is to be used in conjunction with either bare or factory pre-coated pipe such as but not limited to: coal tar enamel (CTE); or extruded PE or PP; or PE, PVC tape wraps; or FBE. The procedure outlined covers the following areas - welded joints, bends, elbows and tees, short runs of base pipe fabricated in the field, station piping and patching. The procedure also covers new, mill-supplied, bare pipe lengths.

2.0 GENERAL REQUIREMENTS

The Contractor shall furnish all materials, labour, equipment, tools, instruments, and supervision incidental to and necessary for the application of the coating in accordance with this Specification.

3.0 COATING MATERIALS

The coating material(s) shall be specified as follows:

Coating: KEMA Series 60 Module Sealant c/w PE Backing;
Primer: Polyguard 600;
Sealant: KEMA Series 60 Module Sealant w/o PE Backing;
Cleaner: Methyl Ethyl Ketone (MEK) or Xylene

4.0 STORAGE OF MATERIALS

All materials shall be transported and stored at a temperature between 41^0F./ 5^oC. and 100^0F./38^oC. In addition the material shall be stored in an environment of not less than 50^0F./10^oC. for approximately three hours prior to application.

5.0 SURFACE PREPARATION

5.1 Remove dirt, grease and oil and all moisture and frost in accordance with the requirements of SSPC-SP-1, Solvent Cleaning.

5.2 Remove weld splatter, sharp points and edges. Welds shall not be hot, just warm to the touch.

5.3 Remove loose rust, paint and foreign material by hand or with power tool cleaning in accordance with SSPC-SP-2 or SP-3, Hand Tool Cleaning or Power Tool Cleaning, respectively.

5.4 Mechanical grit blast cleaning or high pressure water blast can also be used to prepare the surface.

6.0 PRIMER APPLICATION

6.1 After proper surface preparation a liquid primer, **Polyguard 600**, shall be stirred and applied sparingly in a uniform and continuous method to the steel surface.

6.2 Primer application may be by spray, brush or roller.

6.3 **Primer shall be dry to the touch before applying KEMA Series 60 Module Sealant.**

6.4 No foreign matter shall come in contact with the primed surfaces prior to applying KEMA Series 60 Module Sealant.

6.5 The primer application shall be limited to that amount of pipe that can be tape wrapped during the same work day otherwise the surface must be re-primed. Re-priming shall not take place until all dust, dirt, moisture and other foreign matter has been removed.

7.0 MODULE SEALANT APPLICATION

7.1 Module Sealant shall be used to coat all miscellaneous pipe but not limited to - welded joints, bends, elbows and tees, short runs of base pipe fabricated in the field, station piping and patching. The procedure also covers new, mill-supplied, bare pipe lengths.

7.2 KEMA Series 60 is applied after proper surface preparation and priming by removing the brown paper release liner and spiral wrapping with a 1/2" minimum overlap. (A minimum 1inch/2.54cm. overlap is recommended).

7.3 For welded joints the wrapping shall start and stop at least one full width of the size of module sealant in use onto the factory or existing coating.

7.4 Care shall be taken that the module sealant conforms to the "cutback" of the factory coating and the weld area. No voids, minimum wrinkles or “tenting” shall be permitted.

7.5 A mechanical hand wrapping machine may be used to apply KEMA Series 60 Module Sealant for lengths of pipe shipped bare to the field.

7.6 A repair patch of the factory coating is made by removing all loose or disbonded material from around the area of the "holiday". No sharp points, burrs, or rough edges shall appear around the factory coating edges. These edges shall be "feathered" smooth.

7.7 Refer to Sections 5 and 6 for proper surface preparation and primer application.

7.8 The exposed area of steel shall be repaired using the same system of primer and cold applied Module Sealant as referred to in Section 7.

7.9 Patched areas shall overlap the adjacent, undamaged, factory coating a minimum of 2 inches/5cms..

7.10 The Module Sealant shall be worked down onto the surface of the steel so as to leave no voids and only minimum wrinkles appearing on the new piece of wrap.

7.11 Pinholes shall be covered over without priming with a minimum of 4squ.in./26.17sq.cm. of Module Sealant.

8.0 HOLIDAY DETECTION

8.1 Tinker & Rasor Model A-P or Remco Model RX Holiday detector or approved alternate with brushes or coil springs shall be used in accordance with the manufacturer's recommendations.

8.2 Holiday detection shall take place only once just prior to backfilling and after all welded joints and other assemblies have been coated with KEMA Series 60 Module Sealant.

9.0 STORAGE, HANDLING AND SHIPPING OF COATED PIPE

9.1 Coated pipe shall be handled and stored in such a manner as to prevent damage to the coating.

9.2 All booms, forks, supports and skids used in the handling or storing of coated pipe shall be padded.

9.3 Pipe shall be shipped using sufficient padding to adequately protect the pipe coating. Chains or steel bands shall not be used.

10.0 BACKFILL

10.1 Backfill adjacent to the coated pipe shall be free from scrap, sticks, large stones, rocks or other debris which may work to damage the coating.

THE END. VERSION 19 MAY 2007..

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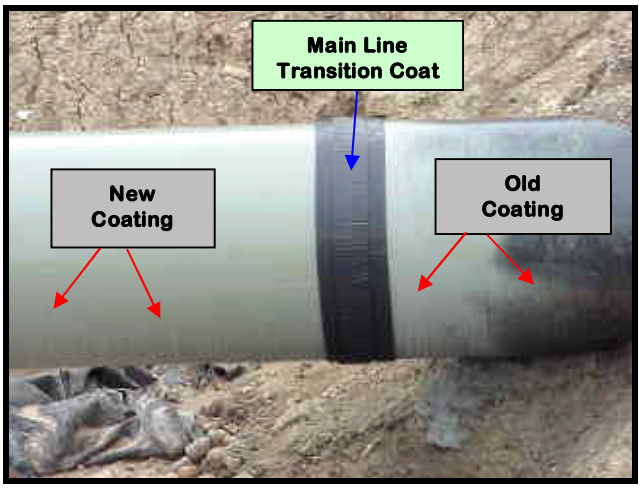
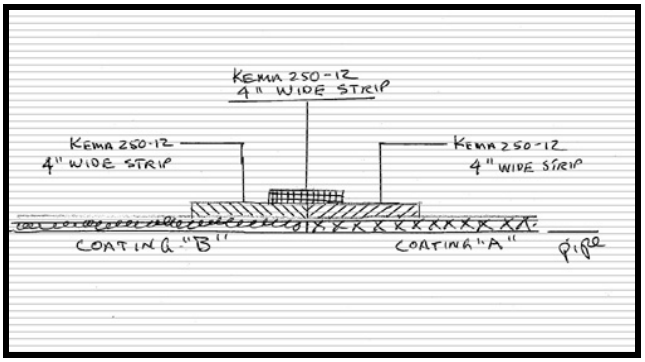
APPLICATION BULLETIN NO.3 - KEMA MODULE SEALANTS

COATING and PAINTING SPECIFICATIONS

MAINLINE COATING TRANSITION COLD APPLIED MODULE SEALANT - <KEMA 250-12>





MAINLINE Transition Procedure for Old to New Coatings

1.0 Scope

These procedures describe the technical requirements for tying- in old parent coatings to newly applied Epoxy, Polyurethane or FBE coatings.

2.0 Storage

Maintain tape at temperatures between 15°C and 30°C for at least 8 hours immediately prior to use.

3.0 Surface Preparation

Remove dirt, dust, moisture and other contaminants from both old and new coatings.

4.0 Application of Module Sealant

Find the point on the newly recoated pipe where the old mainline coating ends and the new mainline coating begins. This shall be referred to as “the transition point” from old to new coating.

Use this general location as the starting point for the first strip of four inch wide KEMA 250-12 module sealant to be applied so that the “inside” edge of the 250-12 generally follows this transition point all around the coated pipe circumference. Carefully remove the paper interleaf protection sheet from the 250-12 and press the 250-12 firmly into place.

A second wrap of KEMA 250-12 is then positioned alongside the first wrap. Its inside edge now butts up against the first and follows the first wrap all around the circumference of the pipe. Once again carefully remove the paper interleaf sheet from the 250-12 then press the 250-12 firmly into place.

You shall now end up with two strips of 250-12 side-by-side and measuring 8 inches in width in total.

Use your thumb and forefinger to pinch the inside edges of both strips of KEMA 250-12 together all around the circumference of the pipe.

Do not overlap either strip of 250-12 onto itself or onto the next strip.

To finish, prepare a final four inch wide strip of KEMA 250-12 then position it so that it is centered over the butted and joined inside edges of the two previous strips with two inches on either side of the transition point.

Carefully remove paper interleaf from sticky side of 250-12 and apply. (See photo and diagram above). Use some tension to apply the final layer to obtain conformability and a wrap that is largely free of wrinkles and air pockets.

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