National Liner®

Cured-In-Place Pipeline Rehabilitation
& Unmatched Product Performance.

Cured-In-Place Pipeline Repair:

A Time-Tested, Proven Pipeline Rehabilitation System

For more than 30 years, Cured-In-Place Pipe (CIPP) has proven to be one of the most cost-effective methods of repair to damaged and corroded pipelines. Thousands of installations and millions of feet of later, CIPP remains the leader and the preferred method of trenchless repair of municipal and industrial sewer lines. Its strength, life expectancy, chemical resistance and non-disruptive installation have revolutionized the pipe rehabilitation industry.

The Product: National Liner®

National Liner consists of two primary components. The first is a precisely fabricated, non-woven and needled polyester felt liner. The second, a thermosetting resin, thoroughly saturates the liner during the manufacturing process.

National Liner is not limited in diameter or wall thickness and can be specifically manufactured for pipelines ranging from 6" to 84" in diameter. It also has a 50-year design life and economically restores damaged pipelines to their original specified operating efficiencies.

The Benefits:

A Long Term, Trouble-Free Pipeline Rehabilitation Solution

In addition to strengthening the host pipe and halting the infiltration of ground water, the physical properties of National Liner resist corrosion and abrasion caused by effluents. Upon project completion, National Liner's smooth inner surface actually increases the flow capacity of the pipe and helps reduce turbulence. Here are a few more reasons why you should specify National Liner:

Performance and Testing:

- Meets or exceeds installation standards per ASTM F-1216
- Flexural Modulus of Elasticity exceeds 250,000 psi per ASTM D-790
- Flexural strength exceeds 4,500 psi per ASTM D-790
- Tensile Strength exceeds 3,000 psi per ASTM D-638
- Meets or exceeds Resin Corrosion Testing per ASTM C-581
- Meets or exceeds 50-year design life criteria per ASTM D-2990
- L.A. Greenbook qualified
- All material components produced in ISO 9002 certified facilities

Product Features:

- Can repair damaged pipelines made from any material
- Negotiates bends and transitions in both size and shape
- Spans missing sections, cracks and offset joints
- Jointless construction eliminates root intrusion and groundwater infiltration
- Fits tight, allowing for a mechanical lock into existing pipe
- Strengthens pipes weakened by cracks and corrosion

Engineered Pipeline Rehabilitation System:

The science of Cured-In-Place Pipe has been long studied and well documented. National Liner is a proprietary system of trenchless pipeline reconstruction and is manufactured and installed to meet individual project specifications.

Critical to any National Liner installation is the use of accurate design data. National Liner offers free *Engineering Design Software* on its website (www.nationalliner.com). This online program allows you to input your design criteria to determine the CIPP liner design thickness specifications for your project.

Experienced & Qualified Contractors:

Another key ingredient to a successful installation is the contractor. Since it is a proprietary product, National Liner can only be installed by licensed, trained and experienced utility contractors. Each contractor in the National Liner network has been carefully selected to ensure each project is completed on time, on budget and mistake free.

The Process:

Fast, Simple & Non-disruptive Installation

1. After the host pipe has been cleaned, the resin impregnated softliner is readied for insertion into the pipeline from an upstream manhole.

2. The liner is inverted or winched into place, then expanded using a hydrostatic head of water, air or steam pressure to press it firmly against the interior of the host pipe. During this process, excess resin is forced into cracks, joints and irregularities of the host pipe resulting in a permanent bond between new and old pipe.

3. Heat is then introduced throughout the liner to cure (polymerize) the resin. Once cured, a new structural pipe is formed within the damaged host pipe.

4. After the cure is complete, lateral lines are re-opened using a remote controlled cutting tool. The pipeline is then video inspected to insure it meets owner specifications.

VISU-SEWER, INC.

Visu-Sewer

For over 30 years, Visu-Sewer has responded with the most advanced technologies to the challenges presented by America's aging and decaying collection systems. As a result, we can provide a wide array of sophisticated diagnostic tools to investigate and assess the exact condition of your system. We also have the expertise and experience to recommend the most cost-effective solution for treatment. Once the diagnosis is complete, proper treatment can begin. Visu-Sewer offers the most complete range of modern technologies available in America today for the rehabilitation or replacement of collection systems. We also provide a complete, professional contract maintenance program to ensure your collection system operates at peak efficiency.

Diagnosis:

Video Inspection

- Color Cameras
- Pan and Tilt, Radial-View and Mini Cameras
- Skid, Float Transporters and Walkthrough
- Lateral Evaluation Televising Systems (LETS)

Additional Services:

- Smoke Testing
- Dye-Water Flooding
- Sump Pump Inspections
- Manhole Inspections

Trenchless Rehabilitation:

Manholes

- Manhole Sealing
- Manhole Lining - Raven® (Epoxies) and Strong Seal™ (Cementitious)

Pipelines:

- NATIONAL LINER® (Cured-in-Place)
- U-Liner® (Fold and Form)
- Pipebursting
- Sliplining
- Short Line Repair (Cured-in-Place)
- Mainline Test-and-Seal Grouting
- Lateral Grouting

Maintenance:

Pipelines

- Preventative & Contact Maintenance Programs
- Protruding Tap Removal
- Root Cutting
- Mineral Deposit Removal
- Jet/Vac Service

Corporate Office: W230N4855 Betker Road • Pewaukee, WI 53072-1430 • (262) 695-2340 • Fax: (262) 695-2359
Email: visuinfo@visu-sewer.com

Branch Office: 7905 Beech St. NE • S Fridley, MN 55432-1762 • (763) 252-0004 • Fax: (763) 252-0008

Website: www.visu-sewer.com

AOC
World Leader in Resin Technology

Vipel®
L721-LTA Series
Polyester Resin

Product Information

Vipel Isophthalic Based Resin for Underground Sewer Pipe Liners

TYPICAL FILLED LIQUID RESIN PROPERTIES* (1) see back page

	Nominal
Viscosity @ 77°F/25°C, RVF Brookfield Spindle #4 @ 20 RPM, cps.	6,200
Thix Index 2/20	2.7+
Color	Opaque
Specific Gravity @ 77°F/25°C	1.255
Styrene, %	32
Gel Time @ 140°F with (1.0% Di-(4-tert-butyl-cyclohexyl) peroxydicarbonate and 0.5% Trigonox® KSM), minutes	14
Pot Life @ 77°F/25°C (1% Di-(4-tert-butyl-cyclohexyl) peroxydicarbonate and + 0.5% Trigonox® KSM), hours	40

Trigonox is a trademark of Akzo Nobel Chemicals

TYPICAL FILLED CAST MECHANICAL PROPERTIES* (2) See back page

		Test Method
Tensile Strength, psi/MPa	7,220/50	ASTM D 638
Tensile Modulus, psi/GPa	690,000/4.8	ASTM D 638
Tensile Elongation, %	1.8	ASTM D 638
Flexural Strength, psi/MPa	12,300/85	ASTM D 790
Flexural Modulus, psi/GPa	700,000/4.8	ASTM D 790
Heat Distortion Temperature, °F/°C @ 264 psi	237/114	ASTM D 648
Barcol Hardness	42	ASTM D 2583

*Typical properties are not to be construed as specifications.

DESCRIPTION

The Vipel L721-LTA Series is a high molecular weight isophthalic/unsaturated polyester resin. The Vipel L721-LTA Series provides the corrosion resistance, durability and toughness that is required for cured in place pipe applications.

BENEFITS

- Excellent catalyzed pot life
- Superior mechanical properties
- High molecular weight

Vipel®
L721-LTA Series
Polyester Resin

PERFORMANCE GUIDELINES

A. Keep full strength catalyst levels between 1.0% - 3.0% of the total resin weight.

B. Maintaining shop temperatures between 65°F/18°C and 90°F/32°C and humidity between 40% and 90% will help the fabricator make a high quality part. Consistent shop conditions contribute to consistent gel times.

STORAGE STABILITY

Resins are stable for three months from date of production when stored in the original containers away from sunlight at no more than 77°F/25°C. After extended storage, some drift may occur in gel time.

During the hot summer months, no more than two months stability at 86°F/30°C should be anticipated.

SAFETY

See appropriate Material Safety Data Sheet for guidelines.

ISO 9001:2008 CERTIFIED

The Quality Management Systems at every AOC manufacturing facility have been certified as meeting ISO 9001:2008 standards. This certification recognizes that each AOC facility has an internationally accepted model in place for managing and assuring quality. We follow the practices set forth in this model to add value to the resins we make for our customers.

FOOTNOTES

(1)

The pot life times shown are typical but may be affected by catalyst, promoter and inhibitor concentrations in resin, and environmental temperature. Variations in gelling characteristics can be expected between different lots of catalysts and at extremely high humidities. Pigment and fillers can retard or accelerate gelation. It is recommended that the fabricator check the gelling characteristics of a small quantity of resin under actual operating conditions prior to use.

(2)

Based on tests on Vipel L721-LTA Series pipe at 77°F/25° and 50% relative humidity. Ccastings were prepared using 1.0% Perkadox 16 and 0.5 Trigonox C.

AOC®
World Leader in Resin Technology

North America
northamerica@aoc-resins.com
Toll Free: +1 (866) 319-8827
www.aoc-resins.com

Global Contacts

Australia
australia@aoc-resins.com
Middle East
middleeast@aoc-resins.com
Latin America
latinamerica@aoc-resins.com
Africa
africa@aoc-resins.com
Asia\Australia
asia@aoc-resins.com
Europe
europe@aoc-resins.com

Effective Date: January 2011

Felt Liner Material Data

National Liner®

Cure-Line Pipe Inversion Tube

Description

A multiple layer felt liner with impermeable coating conforming to ASTM-1216

APPLIED FELTS

Application

Installation Method: Inversion
Impregnation Method: Vacuum impregnation and pressure rollers

Curing Methods

Resin Type	Coating	Warm Water < 50°	Hot Water < 90°	Steam < 110°
Polyester	Polyurethane	Yes	Yes	Yes
	PVC	Yes	N/A	N/A
Vinyl Ester	Polyurethane	N/A	Yes	Yes
	PVC	N/A	N/A	N/A
Epoxy	Polyurethane	Yes	Yes	Yes
	PVC	Yes	N/R	N/R

N/A = Not Applicable • N/R = Not Recommended

Diameter

Generally (6" to 80")

Thickness Range

1.5 mm to 100 mm

Available Manufactured Lengths

Any length made to order

This Product Information sheet gives general information. Exact coating type and thickness will depend on the types of resin being used. Please contact our Technical Team for specific advice.

National Liner, L.L.C.

11767 Katy Freeway, Suite 490
Houston, Texas 77079
281-741-4877
800-547-1235
Fax 281-741-3857

June 3, 2013

Visu- Sewer, Inc.
W230 N4855 Betker Road
Pewaukee, WI 53072

Attn: Mr. Keith Alexander, President

Dear Keith:

This is to inform whoever may be concerned that Visu-Sewer, Inc. is a Licensee of the National Liner® product as manufactured by National Liner, L.L.C. As such, Visu-Sewer, Inc. is entitled to exclusive rights, including the right and license to use the proprietary information, the right and license under said Trade Mark Rights to market and install National Liner.

Regards,

Scott A Roth
Director
National Liner, L.L.C.

National Liner, L.L.C.

375 Williamstowne, Suite 102
Delafield, Wisconsin 53018
Phone: 262-303-4098
Toll Free: 800-547-1235
Fax: 262-303-4764

January 1, 2016

Re: National Liner® Certification of Compliance for CIPP Lining Services

To Whom It May Concern:

In support of the qualification specified in the contract documents to certify compliance with the requirements for the installation of Cured-In-Place Pipe (CIPP);this is to advise the reader that the National Liner CIPP product is designed and installed such that the product fully exceeds all the requirements of ASTM D-5813 and F-1216. Per the attached, flexural creep testing was performed in accordance with ASTM D-2990. Extrapolation of the data permits designs for up to an expected design life of 50 years. Based on this data, our engineering team has verified that one could anticipate the design values up to as much as a 75 year design service life.

National Liner L.L.C., licensor of the National Liner CIPP process, is one of the major installers of CIPP in the U.S. and Canada, through its approved network of licensees. The National Liner process has been used to install over 25,000,000 feet since we began operations in 1994. Our projects have ranged from six- inch (6) diameter linings to eighty-four inch (84) diameter linings including reinstating thousands of laterals. Visu-Sewer, Inc. is an authorized licensed installer, having fulfilled all necessary training requirements to be proficient in the installation of National Liner CIPP product.

AOC, Interplastic and Reichhold resins used with Applied Felts Inc. polyester felt liners are the components for manufacturing National Liner CIPP. The resin is specifically formulated for use in rehabilitation of sewer lines and has excellent corrosion resistance. The resin has been tested according to ASTM test procedures outlined in ASTM F-1216 and D-5813.

The quality control programs in place at every AOC resin manufacturing facility have been certified as meeting ISO 9002 standards. In addition, Applied Felts lining materials fully meet the requirements of Section 5.1 of ASTM F-1216. Applied Felts operate quality systems complying with ISO 9002 and all materials are tested to ensure suitability to CIPP applications. Each liner is typically tested in 28 different ways allowing for traceable test data for any particular liner.

In summary, National Liner L.L.C. looks forward to supplying a commercially acceptable CIPP rehabilitation technology we are very proud of.

Regards,

Scott A. Roth
Director