Omega-Liner™ Product

Information 2022

Omega-Liner™ Product Information

2022 Table of Contents

Omega-Liner Technical Data Summary

Omega-Liner™ Technical Data

Company Information

Certification Owner	Omega UV Liner Company
Location	Canton, South Dakota

Product Information

Product name	Omega UV Liner
Manufacturing since	2017
Environmentally friendly	No discharge of contaminated water or condensate.
Low carbon footprint	minimal fuel consumption
Inflate procedure	Low pressure high volume blower
Curing method	UV or LED Light
Installation technique	Pull-in Place
Impregnation Location	Manufacturers plant only
Certification	ISO 9001:2015
MSDS Sheet	Available
Resin System(s)	Unsaturated Polyester or Vinyl Ester
Diameter range	6” (150mm) to 66” (1676mm)
Special profiles	Circumferences up to 207 inches
Pipe Transitions	Yes (Example: 15" to 18")

Liner Physical Properties

Reinforcement	EC-R Glass
Chemical resistance	According to ASTM D 543
Barcol hardness according to ASTM 2583	≥ 40
Recovery period	Minimum 50 yrs
Maximum residual styrene content after curing	≤ 3 %
Short-term Flexural Modulus ASTM D 790	2,200,000 psi
Long-term Flexural Modulus ASTM D790	1,460,800 psi
Short-term Flexural Strength ASTM D790	30,000 psi
Long-term Flexural Strength ASTM D790	19,920 psi
Poisson´s ratio according ASTM E3039	< 3
Retention factor after 10.000 h Per ASTM D2990	50y = 66.4%
Creep behavior after 24 h per ASTM D2990	< 10 %

Material Information

Inner Foil

Material	PE / PA
Thickness of foil	6 mils

Outer Protective Foils

Material	PE / PA / PE
Thickness of outer foil	8 mils

Outer Fleece

Material	PP / PP
Outer Fleece Thickness	.35 mm

Reinforcement

Reinforcement material	Glass fiber stitch bonded fabric, non-woven
Textile glass type	EC-R Glass Fiber
Expansion in radial direction	4.0 %
Stretching in axial direction	0 %

Gliding Foil

Material	PE
Thickness of foil	21 mils

Resin System Data:

UP resin group according to DIN 18820/1 & DIN EN 13121/1	3 & 4
UP resin type according to DIN 16946/2	1140
VE resin type according to DIN 16946/2	1310
UP resin based on	Isophthalic acid / Neopentyl glycol
Curing Agents	UV-Curing: UV-initiators
Reaction shrinkage of the pure resin	8 %
Content of styrene before curing	Approx. 39-42 %
Barcol Hardness in accordance with ASTM D2583	48
Tensile Elongation in accordance with ASTM D638	3.1%

Resin Physical Data

Viscosity, @77°F/25°C, RVF Brookfield Spindle #2 @ 20 rpm	800 cps
Peak Exotherm	356°F - 419°F
Flash Point	88 °F

Omega-Liner Material Safety Data Sheets

Section 1. Identification

Product name Omega Liner, Unsaturated Polyester

Product type Composite Pipe Repair Liner Impregnated with UP Resin

Chemical family Aromatic

SDS No. L549

Relevant identified uses of the substance or mixture and uses advised against

Identified uses Used in the Remediation of Pipes.

Uses advised against No additional information.

Supplier's details

Omega Liner Company
515 Noid Road
Canton, SD 57013
Website:
www.omegauvpipe.com
Phone Number: +1 (605) 558-1020
Hours: 8am-4pm (Central Time) Monday-Friday

Emergency telephone number (with hours of operation)

CHEMTREC (US): 24 hours/7 days (800) 424-9300
CANUTEC (Canada): 24 hours/7 days (613) 996-6666

Section 2. Hazards identification

OSHA/HCS status

This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture

FLAMMABLE LIQUIDS – Category 3 – H226
ACUTE TOXICITY (INHALATION) – Category 4 – H332
SKIN CORROSION/IRRITATION – Category 2 – H315
SERIOUS EYE DAMAGE/ EYE IRRITATION – Category 2 – H319
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) – Category 3 – H335
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) – Category 1 – H372

GHS label elements

Hazard pictograms

Signal word

Danger

Hazard statements

H226: Flammable liquid and vapor.
H332: Harmful if inhaled.
H319: Causes serious eye irritation.
H315: Causes skin irritation.
H335: May cause respiratory irritation.
H372: Causes damage to organs through prolonged or repeated exposure if inhaled.

Precautionary statements

General

P101: If medical advice is needed, have product container or label at hand.
P102: Keep out of reach of children.

Section 2. Hazards identification

Prevention

P210: Keep away from heat, sparks, open flames and hot surfaces. - No smoking.
P233: Keep container tightly closed.
P240: Ground/bond container and receiving equipment.
P241: Use explosion-proof electrical/ventilating/lighting/material-handling equipment.
P242: Use only non-sparking tools.
P243: Take precautionary measures against static discharge.
P264: Wash hands thoroughly after handling.
P270: Do not eat, drink or smoke when using this product.
P271: Use only outdoors or in a well-ventilated area.
P280: Wear protective gloves/protective clothing/eye protection/face protection.
P260: Do not breathe vapor or mist.

Response

P370+P378: In case of fire: Use dry chemical, CO_2, water spray (fog) or foam.
P309+P311: IF exposed or if you feel unwell: Call a POISON CENTER or doctor/physician if exposed or you feel unwell.
P304+P340: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P312: Call a POISON CENTER or physician if you feel unwell.
P303+P361+P353: IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower.
P332+P313: If skin irritation occurs, get medical advice/attention.
P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337+P313: If eye irritation persists, get medical advice/attention.
P391: Collect spillage.

Storage

P403 + P235: Store in a well-ventilated place. Keep cool.
P233: Keep container tightly closed.
P405: Store locked up.

Disposal

P501: Dispose of contents and container in accordance with all local, regional, national, and international regulations.

Hazards not otherwise classified

None known.

Section 3. Composition/information on ingredients

Substance/mixture: Mixture.

Ingredient name	CAS number	%
Styrene	100-42-5	18.0

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact

Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Use of buffered baby shampoo will aid in removal. If irritation persists, get medical attention.

Inhalation

Move the victim to a safe area as soon as possible. Allow the victim to rest in a well-ventilated area. If breathing is difficult, give oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Skin contact

In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. If irritation persists, seek medical attention. Wash contaminated clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion

Section 4. First aid measures

Wash out mouth with water. Remove dentures if any. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Seek immediate medical attention.

Most important symptoms/effects, acute and delayed

Eye contact

Causes serious eye irritation.

Inhalation

Harmful if inhaled. May cause respiratory irritation.

Skin contact

Causes skin irritation.

Ingestion

Irritating to mouth, throat and stomach.

Over-exposure signs/symptoms

Eye contact

Adverse symptoms may include the following: pain or irritation, watering, redness.

Inhalation

Adverse symptoms may include the following: respiratory tract irritation, coughing.

Skin contact

Adverse symptoms may include the following: irritation, redness.

Ingestion

Adverse symptoms may include the following: Irritating to mouth, throat and stomach..

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician

Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media

Use dry chemical, CO_2, water spray (fog) or foam.

Unsuitable extinguishing media

Do not use water jet.

Specific hazards arising from the chemical

Flammable liquid and vapor. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. Runoff to sewer may create fire or explosion hazard. This material is harmful to aquatic life with long lasting effects. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous thermal decomposition products

Decomposition products may include the following materials: carbon dioxide, carbon monoxide, sulfur oxides halogenated compounds, metal oxide/oxides

Special protective actions for fire-fighters

Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Special protective equipment for fire-fighters

Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel

No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation.

For emergency responders

If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment. See also the information in "For non-emergency personnel".

Environmental precautions

Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities.

Methods and materials for containment and cleaning up

Small spill

Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

Large spill

Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures

Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. Do not breathe vapor or mist. Do not ingest. Avoid contact with eyes, skin and clothing. Avoid release to the environment. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Take precautionary measures against electrostatic discharges. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene

Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities

Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Eliminate all ignition sources. Segregate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. Refer to the product label and/or technical data sheet for further information.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Section 8. Exposure controls/personal protection

Ingredient name	Exposure limits
Styrene	**ACGIH TLV (United States, 3/2015). Absorbed through skin.** TWA: 20 ppm 8 hours. TWA: 85 mg/m³ 8 hours. STEL: 40 ppm 15 minutes. STEL: 170 mg/m³ 15 minutes. **OSHA PEL Z2 (United States, 2/2013).** TWA: 100 ppm 8 hours. AMP: 600 ppm 5 minutes. CEIL: 200 ppm **NIOSH REL (United States, 10/2013).** TWA: 50 ppm 10 hours. Form: TWA: 215 mg/m³ 10 hours. STEL: 100 ppm 15 minutes. STEL: 425 mg/m³ 15 minutes.

Appropriate engineering controls

Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Individual protection measures

Hygiene measures

Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection

Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

Hand protection

Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Body protection

Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection

Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection

Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state	Gelled Liquid, inside Protective material.
Color	Clear, Yellow tinted.
Odor	Aromatic.
Odor threshold	0.01 - 0.1 ppm (*Styrene*)
pH	*Not applicable.*
Melting point	-23.8°F / -30.6°C (*Styrene*)
Boiling point	293°F / 145°C (*Styrene*)
Flash point	88°F / 31°C (*Styrene*)
Evaporation rate	< 1 (Butyl acetate = 1)
Flammability (solid, gas)	*Not applicable.*
Lower and upper explosive (flammable) limits	**Lower:** 1.1% **Upper:** 6.1% (*Styrene*)
Vapor pressure	5.0 mm Hg@ 68°F / 20°C (*Styrene*)
Vapor density	3.6 (Air = 1) (*Styrene*)
Relative density	1.1 (Water = 1) Slight.

Section 9. Physical and chemical properties

Partition coefficient: n-octanol/water	Not available.
Auto-ignition temperature	914°F / 490°C (*Styrene*)
Decomposition temperature	Not available.
Viscosity	Not available.
Molecular weight	1,000 to 15,000

Section 10. Stability and reactivity

Reactivity

No specific test data related to reactivity available for this product or its ingredients.

Chemical stability

The product is stable. Stable under recommended storage and handling conditions (see Section 7).

Possibility of hazardous reactions

Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid

Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

Incompatible materials

Reactive or incompatible with the following materials: oxidizing materials

Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Styrene	LC50 Inhalation Gas. LC50 Inhalation Vapor LD50 Oral	Rat Rat Rat	2770 ppm 11800 mg/m³ 2650 mg/kg	4 hours 4 hours -

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Styrene	Eyes - Mild irritant	Human	-	50 parts per million	-
	Eyes - Moderate irritant	Rabbit	-	24 hours 100 milligrams	-
	Eyes - Severe irritant	Rabbit	-	100 milligrams	-
	Skin - Mild irritant	Rabbit	-	500 milligrams	-
	Skin - Moderate irritant	Rabbit	-	100 Percent	-

Sensitization

May cause sensitization by skin contact.

Carcinogenicity

Classification

Product/ingredient name	ACGIH	IARC	NTP
Styrene	-	2B	Reasonably anticipated to be a human carcinogen.

1) Negative Study A published study concluded that the mechanism for producing cancer in mice exposed to styrene is not applicable in human metabolism. (June 2013 Pharmacology & Toxicology 66 (2013))
2) Negative Study A recent update to an extensive study of reinforced plastic workers from 1948-1977 concluded that there was no coherent evidence that styrene exposure increased risk of cancer (March 2013 Epidemiology Vol. 24 Issue 2)
3) Positive Study Styrene induced pulmonary toxicity and carcinogenicity in mice was shown to be caused by a metabolite of styrene, probably styrene oxide. (Dec.2001 Toxicology Vol.169 Issue 2)

Mutagenicity

No mutagenic effect.

Reproductive toxicity

Section 11. Toxicological information

Not considered to be toxic to the reproductive system.

Teratogenicity

No known effect according to our database..

Specific target organ toxicity (single exposure)

No known effect according to our database.

Specific target organ toxicity (repeated exposure)

A study of long term effects of workers exposed to styrene levels in the range of 25-35 ppm, 8 hour TWA, indicated a possible mild hearing loss.

Aspiration hazard

No known effect according to our database.

Potential acute health effects

Eye contact

Causes serious eye irritation.

Inhalation

Harmful if inhaled. May cause respiratory irritation.

Skin contact

Causes skin irritation.

Ingestion

Irritating to mouth, throat and stomach.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact

Adverse symptoms may include the following: pain or irritation, watering, redness.

Inhalation

Adverse symptoms may include the following: respiratory tract irritation, coughing.

Skin contact

Adverse symptoms may include the following: irritation, redness.

Ingestion

Adverse symptoms may include the following: Irritating to mouth, throat and stomach..

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Styrene	Acute EC50 4.7 mg/l Fresh water Acute LC50 4.02 mg/l Fresh water	Daphnia - Daphnia magna Fish - Pimephales promelas	48 hours 96 hours

Persistence and degradability

Product/ingredient name	Test	Result	Dose	Inoculum
Styrene	EU	100 % - Readily - 1 days	-	-

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
Styrene	-	-	Readily

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Styrene	2.95	13.49	low

Mobility in soil

Soil/water partition coefficient (K_{OC})

Not available.

Other adverse effects

No known effect according to our database.

Section 13. Disposal considerations

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

Disposal methods

The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid disposal. Attempt to use product completely in accordance with intended use. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

Special precautions

This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

DOT / TDG/ IMDG/IMO / ICAO/IATA and National regulations.

US DOT: UN3077, Environmentally Hazardous Substance, solid, n.o.s.("Styrene"), 9, III RQ = 5825lb
Omega Liner = 1000lb Styrene

Additional information:

IMO/IMDG: UN3077, Environmentally Hazardous Substance, solid, n.o.s. (29 degrees centigrade), 9, III

IATA: UN3077, Environmentally Hazardous Substance, solid, n.o.s., 9, III

UN3077, Environmentally Hazardous Substance, solid, n.o.s., 9, III (D/E)

UN3077, Environmentally Hazardous Substance, solid, n.o.s., 9, III

ADN: UN3077, Environmentally Hazardous Substance, solid, n.o.s., 9, III

Environmental hazards Marine pollutant: No, composite/mixture, product does not meet standard

Section 15. Regulatory information

Inventories (National and International)

United States inventory (TSCA 8b) : All components are listed or exempted.

Australia (AICS) : All components are listed or exempted.
Canada (DSL) : All components are listed or exempted.
China (IECSC) : All components are listed or exempted.
Europe (EINECS) : All components are listed or exempted.
New Zealand (NZIoC) : All components are listed or exempted.
Philippines (PICCS) : All components are listed or exempted.
Japan (ENCS) : All components are listed or exempted.

Malaysia (EHS Register) : Not determined.
Republic of Korea (KECI) : All components are listed or exempted.
Taiwan (CSNN) : Not determined.

SARA 311/312

Composition/information on ingredients

Section 15. Regulatory information

Name	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Styrene	Yes.	No.	No.	No.	Yes.

SARA 313

	Product name	CAS number
Form R - Reporting requirements	Styrene	100-42-5

CERCLA RQ - Styrene - 1000 lbs. (453.6 kg)

State regulations

California Prop. 65

WARNING: This product contains a chemical known to the State of California to cause cancer.

Section 16. Other information

National Fire Protection Association (U.S.A.)

History

Date of issue : 03/31/2016

Date of previous issue : NA

Version : 1.0

Key to abbreviations :
ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

Indicates information that has changed from previously issued version.

Notice to reader

The information contained in this data sheet is furnished in good faith and without warranty, representation, or inducement or license of any kind, except that it is accurate to the best of Omega Liner Companies knowledge or was obtained from sources believed by Omega Liner Company to be reliable. The accuracy, adequacy or completeness of health and safety precautions set forth herein cannot be guaranteed, and the buyer is solely responsible for ensuring that the product is used, handled, stored, and disposed of safely and in compliance with applicable federal, state or provincial, and local laws. Omega Liner Company disclaims liability for any loss, damage or personal injury that arises from, or is in any way related to, use of the information contained in this data sheet.

Omega-Liner Material Test Results

HTS Pipe Consultants, Inc.
420 Pickering Street, Houston, TX 77091
www.htspipeconsultants.com

Phone 713-692-8373
Fax 713-692-8502
Toll Free 1-800-692-TEST

February 4, 2019

Omega Liner Company, Inc.
515 Noid Road
Canton, SD 57013

Attn: Mr. Ken Moulds

Re: **Chemical Corrosion Testing**

Dear Mr. Moulds,

One (1) sample of cured-in-place liner was delivered to HTS' laboratory for testing. The test requirements and test identification are as follows:

ASTM F1216 – 30 Day Chemical Resistance

HTS Report No. OLF818.002Y

Chemical resistance testing was performed in accordance with ASTM D543-06, Evaluating the Resistance of Plastics to Chemical Reagents, using the guidelines set by ASTM F1216-09, Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube, Appendix X2. Nine sets of five (5) test specimens were conditioned in accordance with Procedure A of ASTM D618-13 and then eight sets were exposed to the prescribed reagents for 30 days at 23±2°C following the Practice A – Immersion test of ASTM D543-06. One set was held as a control set and immersed in water prior to initiating the test. Following the chemical exposure, the specimens were weighed, measured and then tested in accordance with ASTM D790-10, Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials, Test Method 1 - Procedure A. The results of the flexural properties testing were then compared to those of the additional control set of five (5) specimens.

The complete results are reported in enclosed tables. Flexural property test results include tangent flexural modulus of elasticity and flexural strength at maximum load.

We very much appreciate the opportunity to work with you and Omega Liner Company.

Sincerely,
HTS Pipe Consultants

Rick Eastwood
Vice-President – Business Development

SUMMARY OF TEST DATA
RESISTANCE OF CIPP TO CHEMICAL REAGENTS

SAMPLE ID: **Duration:** 1 Year **Date Tested:** 1/31/2019

Chemical Reagent (Concentration)	Mechanical Property	Test Method ASTM D	Unit	Control Sample	1 Year	
					Value	% Change
Vegetable Oil (100%)	Observation	543		N/A	No Change	
	Weight	543	g	282.24	282.91	0.24
	Thickness	2122	in.	0.179	0.179	0.00
			mm.	4.5	4.5	0.00
	Max. Flexural	790	psi	81129	78330	-3.45
	Modulus	790	psi	2472138	2257321	-8.69
Detergent (0.1%)	Observation	543		N/A	No Change	
	Weight	543	g	282.02	282.56	0.19
	Thickness	2122	in.	0.178	0.178	0.00
			mm.	4.5	4.5	0.00
	Max. Flexural	790	psi	81129	73867	-8.95
	Modulus	790	psi	2472138	2356190	-4.69
Soap (0.1%)	Observation	543		N/A	No Change	
	Weight	543	g	278.19	278.85	0.24
	Thickness	2122	in.	0.175	0.175	0.00
			mm.	4.4	4.4	0.00
	Max. Flexural	790	psi	81129	77206	-4.84
	Modulus	790	psi	2472138	2457931	-0.57
Nitric Acid (1.0%)	Observation	543		N/A	No Change	
	Weight	543	g	275.7	276.30	0.22
	Thickness	2122	in.	0.173	0.173	0.00
			mm.	4.4	4.4	0.00
	Max. Flexural	790	psi	81129	74668	-7.96
	Modulus	790	psi	2472138	2302743	-6.85

SUMMARY OF TEST DATA
RESISTANCE OF CIPP TO CHEMICAL REAGENTS

SAMPLE ID: **Duration:** 1 Year **Date Tested:** 1/31/2019

Chemical Reagent (Concentration)	Mechanical Property	Test Method ASTM D	Unit	Control Sample	1 Year	
					Value	% Change
Sulfuric Acid (5.0%)	Observation	543		N/A	No Change	
	Weight	543	g	281.12	281.54	0.15
	Thickness	2122	in.	0.176	0.176	0.00
			mm.	4.5	4.5	0.00
	Max. Flexural	790	psi	81129	74569	-8.09
	Modulus	790	psi	2472138	2256549	-8.72
Ethanol Free Gasoline (100%)	Observation	543		N/A	No Change	
	Weight	543	g	285.59	286.09	0.18
	Thickness	2122	in.	0.176	0.176	0.00
			mm.	4.5	4.5	0.00
	Max. Flexural	790	psi	81129	36847	-54.58
	Modulus	790	psi	2472138	1643143	-33.53
Sodium Hydroxide (0.5%)	Observation	543		N/A	No Change	
	Weight	543	g	273.35	273.91	0.20
	Thickness	2122	in.	0.170	0.170	0.00
			mm.	4.3	4.3	0.00
	Max. Flexural	790	psi	81129	74135	-8.62
	Modulus	790	psi	2472138	2278550	-7.83

HTS Pipe Consultants, Inc.
420 Pickering Street, Houston, TX 77091
www.htspipeconsultants.com

Phone 713-692-8373
Fax 713-692-8502
Toll Free 1-800-692-TEST

Friday, March 02, 2018

FLEXURAL PROPERTIES OF PLASTICS
ASTM D790
3 POINT BEND

INSTRON CORPORATION
BLUEHILL V. 2.26.

OPERATOR NAME:
E. CARRILLO

TEMPERATURE (F) / HUMIDITY (%)
71 / 50

RATE (in/min)
.067

SAMPLE ID:

CONTROL SAMPLE

	WIDTH (in)	THICKNESS (in)	SUPPORT SPAN (in)
1	2.065	0.170	2.5
2	2.063	0.172	2.5
3	2.064	0.173	2.5
4	2.058	0.174	2.5
5	2.065	0.174	2.5

	STRAIN @ MAX (in/in)	MAXIMUM LOAD (lbf)	FLEXURAL STRENGTH (psi)	FLEXURAL MODULUS (psi)
1	0.0418	1359.7	85438	2589751
2	0.0375	1210.9	74400	2352291
3	0.0406	1343.4	81552	2436485
4	0.0404	1343.4	80852	2454366
5	0.0398	1390.5	83401	2527797
Mean	0.0400	1329.6	81129	2472138
Standard Deviation	0.0016	69.1	4162	90666
Minimum	0.0375	1210.9	74400	2352291
Maximum	0.0418	1390.5	85438	2589751

F818-2-C.is_flex

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Thursday, January 31, 2019

FLEXURAL PROPERTIES OF PLASTICS
ASTM D790
3 POINT BEND

INSTRON CORPORATION
BLUEHILL V. 2.26.

OPERATOR NAME:
E. CARRILLO

TEMPERATURE (F) / HUMIDITY (%)
71 / 50

RATE (in/min)
.067

SAMPLE ID:

SAMPLE SOAKED IN VEGETABLE OIL (100%) FOR 1 YEAR

	WIDTH (in)	THICKNESS (in)	SUPPORT SPAN (in)
	2.087	0.176	2.5
2	2.086	0.178	2.5
3	2.089	0.178	2.5
4	2.009	0.180	2.5
5	2.093	0.180	2.5

	STRAIN @ MAX (in/in)	MAXIMUM LOAD (lbf)	FLEXURAL STRENGTH (psi)	FLEXURAL MODULUS (psi)
	0.0417	1327.2	76986	2219301
2	0.0382	1308.5	74244	2175580
3	0.0420	1400.0	79318	2292019
4	0.0427	1431.0	82456	2332574
5	0.0389	1422.2	78644	2267129
Mean	0.0407	1377.8	78330	2257321
Standard Deviation	0.0020	56.2	3025	61421
Minimum	0.0382	1308.5	74244	2175580
Maximum	0.0427	1431.0	82456	2332574

F818-2-6Y.is_flex

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Thursday, January 31, 2019

FLEXURAL PROPERTIES OF PLASTICS
ASTM D790
3 POINT BEND

INSTRON CORPORATION
BLUEHILL V. 2.26.

OPERATOR NAME:
E. CARRILLO

TEMPERATURE (F) / HUMIDITY (%)
71 / 50

RATE (in/min)
.067

SAMPLE ID:

SAMPLE SOAKED IN DETERGENT (.1%) FOR 1 YEAR

	WIDTH (in)	THICKNESS (in)	SUPPORT SPAN (in)
1	2.080	0.170	2.5
2	2.088	0.171	2.5
3	2.088	0.173	2.5
4	2.098	0.173	2.5
5	2.099	0.175	2.5

	STRAIN @ MAX (in/in)	MAXIMUM LOAD (lbf)	FLEXURAL STRENGTH (psi)	FLEXURAL MODULUS (psi)
1	0.0370	1186.7	74033	2382974
2	0.0379	1197.7	73565	2296735
3	0.0371	1191.7	71512	2302430
4	0.0348	1242.5	74203	2437461
5	0.0365	1303.2	76025	2361348
Mean	0.0367	1224.4	73867	2356190
Standard Deviation	0.0011	49.3	1615	58681
Minimum	0.0348	1186.7	71512	2296735
Maximum	0.0379	1303.2	76025	2437461

F818-2-7Y.is_flex

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Thursday, January 31, 2019

FLEXURAL PROPERTIES OF PLASTICS
ASTM D790
3 POINT BEND

INSTRON CORPORATION
BLUEHILL V. 2.26.

OPERATOR NAME:
E. CARRILLO

TEMPERATURE (F) / HUMIDITY (%)
71 / 50

RATE (in/min)
.067

SAMPLE ID:

SAMPLE SOAKED IN SOAP (.1%) FOR 1 YEAR

	WIDTH (in)	THICKNESS (in)	SUPPORT SPAN (in)
1	2.092	0.170	2.5
2	2.077	0.172	2.5
3	2.095	0.172	2.5
4	2.091	0.178	2.5
5	2.091	0.178	2.5

	STRAIN @ MAX (in/in)	MAXIMUM LOAD (lbf)	FLEXURAL STRENGTH (psi)	FLEXURAL MODULUS (psi)
1	0.0354	1253.5	77749	2527162
2	0.0370	1279.2	78071	2470586
3	0.0367	1233.6	74639	2411142
4	0.0394	1360.9	77031	2397797
5	0.0371	1387.5	78538	2482966
Mean	0.0371	1303.0	77206	2457931
Standard Deviation	0.0014	67.7	1536	53351
Minimum	0.0354	1233.6	74639	2397797
Maximum	0.0394	1387.5	78538	2527162

F818-2-8Y.is_flex

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Thursday, January 31, 2019

FLEXURAL PROPERTIES OF PLASTICS
ASTM D790
3 POINT BEND

INSTRON CORPORATION
BLUEHILL V. 2.26.

OPERATOR NAME:
E. CARRILLO

TEMPERATURE (F) / HUMIDITY (%)
71 / 50

RATE (in/min)
.067

SAMPLE ID:

SAMPLE SOAKED IN NITRIC ACID (1.%) FOR 1 YEAR

	WIDTH (in)	THICKNESS (in)	SUPPORT SPAN (in)
1	2.084	0.167	2.5
2	2.094	0.172	2.5
3	2.088	0.173	2.5
4	2.090	0.175	2.5
5	2.089	0.177	2.5

	STRAIN @ MAX (in/in)	MAXIMUM LOAD (lbf)	FLEXURAL STRENGTH (psi)	FLEXURAL MODULUS (psi)
1	0.0369	1157.3	74667	2293784
2	0.0358	1197.7	72504	2307743
3	0.0376	1267.7	76072	2335219
4	0.0382	1294.3	75832	2350842
5	0.0387	1296.1	74265	2226127
Mean	0.0374	1242.6	74668	2302743
Standard Deviation	0.0011	62.2	1429	48331
Minimum	0.0358	1157.3	72504	2226127
Maximum	0.0387	1296.1	76072	2350842

F818-2-9Y.is_flex

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Thursday, January 31, 2019

FLEXURAL PROPERTIES OF PLASTICS
ASTM D790
3 POINT BEND

INSTRON CORPORATION
BLUEHILL V. 2.26.

OPERATOR NAME:
E. CARRILLO

TEMPERATURE (F) / HUMIDITY (%)
71 / 50

RATE (in/min)
.067

SAMPLE ID:

SAMPLE SOAKED IN SULFURIC ACID (5.0%) FOR 1 YEAR

	WIDTH (in)	THICKNESS (in)	SUPPORT SPAN (in)
1	2.091	0.172	2.5
2	2.078	0.174	2.5
3	2.080	0.175	2.5
4	2.085	0.176	2.5
5	2.089	0.178	2.5

	STRAIN @ MAX (in/in)	MAXIMUM LOAD (lbf)	FLEXURAL STRENGTH (psi)	FLEXURAL MODULUS (psi)
1	0.0352	1155.5	70046	2331248
2	0.0371	1242.1	74038	2244193
3	0.0383	1331.6	78392	2272167
4	0.0374	1274.8	74019	2273726
5	0.0395	1347.6	76350	2161413
Mean	0.0375	1270.3	74569	2256549
Standard Deviation	0.0016	77.0	3116	61892
Minimum	0.0352	1155.5	70046	2161413
Maximum	0.0395	1347.6	78392	2331248

F818-2-10Y.is_flex

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Thursday, January 31, 2019

FLEXURAL PROPERTIES OF PLASTICS
ASTM D790
3 POINT BEND

INSTRON CORPORATION
BLUEHILL V. 2.26.

OPERATOR NAME:
E. CARRILLO

TEMPERATURE (F) / HUMIDITY (%)
71 / 50

RATE (in/min)
.067

SAMPLE ID:

SAMPLE SOAKED IN ETHANOL FREE GASOLINE (100%) FOR 1 YEAR

	WIDTH (in)	THICKNESS (in)	SUPPORT SPAN (in)
1	2.091	0.177	2.5
2	2.078	0.178	2.5
3	2.087	0.178	2.5
4	2.090	0.178	2.5
5	2.093	0.179	2.5

	STRAIN @ MAX (in/in)	MAXIMUM LOAD (lbf)	FLEXURAL STRENGTH (psi)	FLEXURAL MODULUS (psi)
1	0.0395	680.7	38967	1676980
2	0.0345	602.4	34312	1555903
3	0.0371	631.7	35825	1689472
4	0.0387	662.3	37503	1631192
5	0.0388	672.9	37628	1662167
Mean	0.0377	650.0	36847	1643143
Standard Deviation	0.0020	32.5	1803	53402
Minimum	0.0345	602.4	34312	1555903
Maximum	0.0395	680.7	38967	1689472

F818-2-11Y.is_flex

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Thursday, January 31, 2019

FLEXURAL PROPERTIES OF PLASTICS
ASTM D790
3 POINT BEND

INSTRON CORPORATION
BLUEHILL V. 2.26.

OPERATOR NAME:
E. CARRILLO

TEMPERATURE (F) / HUMIDITY (%)
71 / 50

RATE (in/min)
.067

SAMPLE ID:

SAMPLE SOAKED IN SODIUM HYDROXIDE (0.5%) FOR 1 YEAR

	WIDTH (in)	THICKNESS (in)	SUPPORT SPAN (in)
1	2.078	0.165	2.5
2	2.086	0.168	2.5
3	2.090	0.169	2.5
4	2.082	0.170	2.5
5	2.087	0.170	2.5

	STRAIN @ MAX (in/in)	MAXIMUM LOAD (lbf)	FLEXURAL STRENGTH (psi)	FLEXURAL MODULUS (psi)
1	0.0382	1167.9	77415	2393456
2	0.0376	1173.9	74773	2220240
3	0.0366	1176.8	73928	2360889
4	0.0367	1141.6	71151	2188277
5	0.0376	1180.7	73409	2229887
Mean	0.0373	1168.2	74135	2278550
Standard Deviation	0.0007	15.6	2272	92060
Minimum	0.0366	1141.6	71151	2188277
Maximum	0.0382	1180.7	77415	2393456

F818-2-12Y.is_flex

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September 9, 2019

Omega Liner Company, Inc.
515 Noid Road
Canton, SD 57013

Attn: Dave McConnell

One (1) sample of UV-cured fiberglass pipe liner was delivered to HTS' laboratory for testing. The client identified the sample and test requirements as follows:

10,000 Hour Test Report
ASTM D2990 Flexural Creep Test
50-Year Linear Extrapolation
HTS Report No. OLF818.009B

Flexural Creep testing was performed in accordance with **ASTM D2990-09 Section 6.3, Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics**, using the guidelines set by **ASTM F2019-11, Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place thermosetting Resin Pipe (CIPP), ASTM D3567 Standard Practice for Determining Dimensions of "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Fittings and ASTM D790 Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents**.

One (1) set of three (3) test specimens were conditioned in accordance with Procedure A of ASTM D618-13, prepared in accordance with ASTM D790, and placed on the test rack with the calculated amount of force applied. One set was held as a control set. The results of the specimen's flexural properties testing were then compared to those of the additional control set of five (5) specimens.

The results are reported in enclosed tables. The 50 year modulus was determined by extrapolating the data set using linear trend line analysis contained within commercially available software (Microsoft Excel). Using this linear trend line analysis extrapolation of the data set, the 50 year (438,000 hour) modulus was calculated to be 1,141,973 psi (69.8% retention).

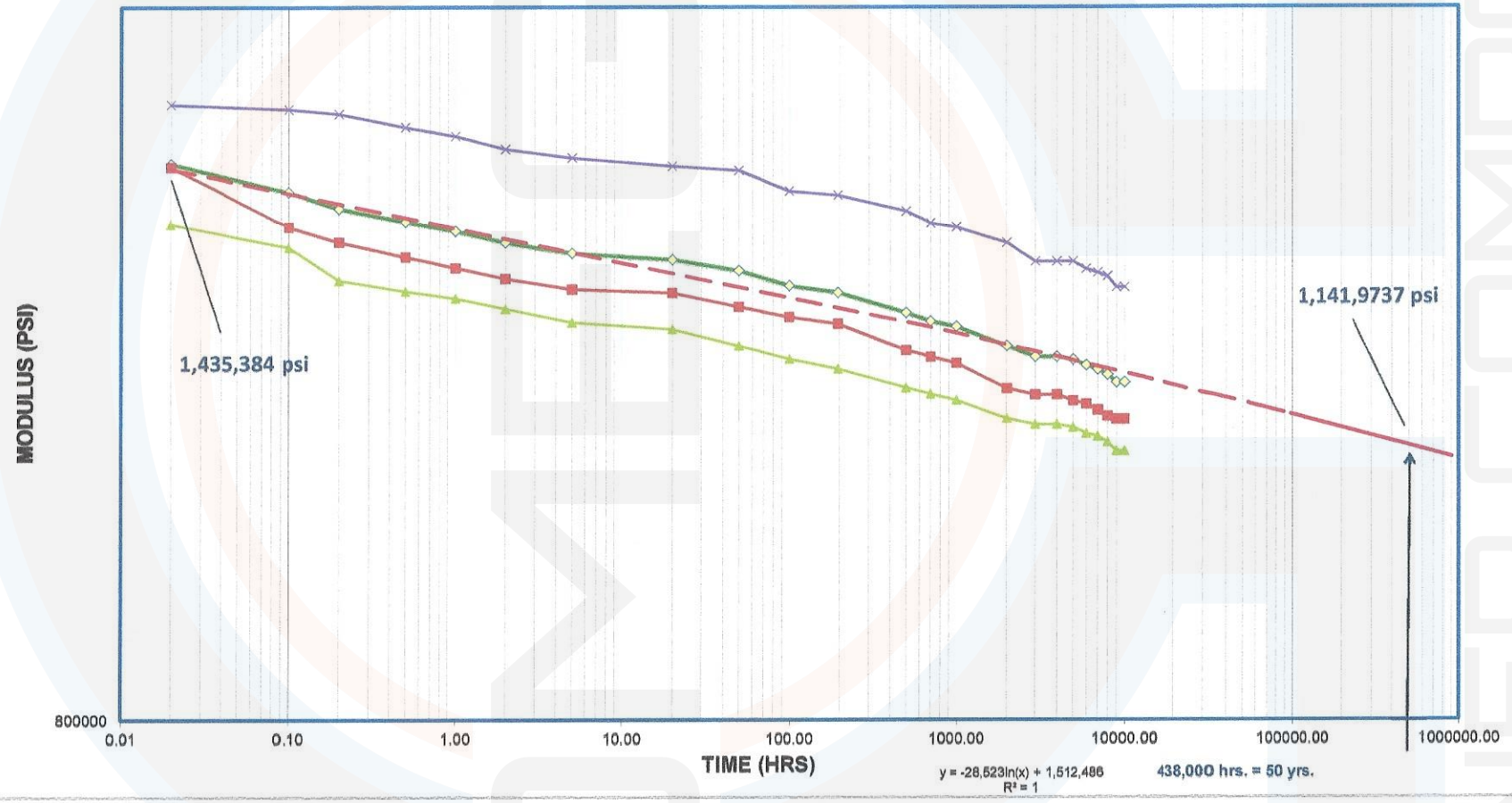
We very much appreciate the opportunity to work with you and Omega Lining Company. Please let me know if you have any questions or comments.

Sincerely,
HTS Pipe Consultants

Rick Eastwood
Vice President

HTS Pipe Consultants, Inc.
420 Pickering, Houston, Texas 77091
Tel: (713) 692-8373 Fax: (713) 692-8502

FLEXURAL CREEP
(ASTM D2990)



Project Name:	**Omega Lining**	**Modulus = 1,141,973 psi (extrapolated to 50 years)**	**Test Temperature : 71° F**
Report Date :	**September 9, 2019**	**% Retained = 69.8**	**Laboratory Humidity : 50%**
Sample ID No.:		**Line from Lab test data**	**Specimen Gage Length : 2.3"**
HTS Report#:	**OLF818.009B**	**Line from linear extrapolation**	**Stress : 5,000 psi**

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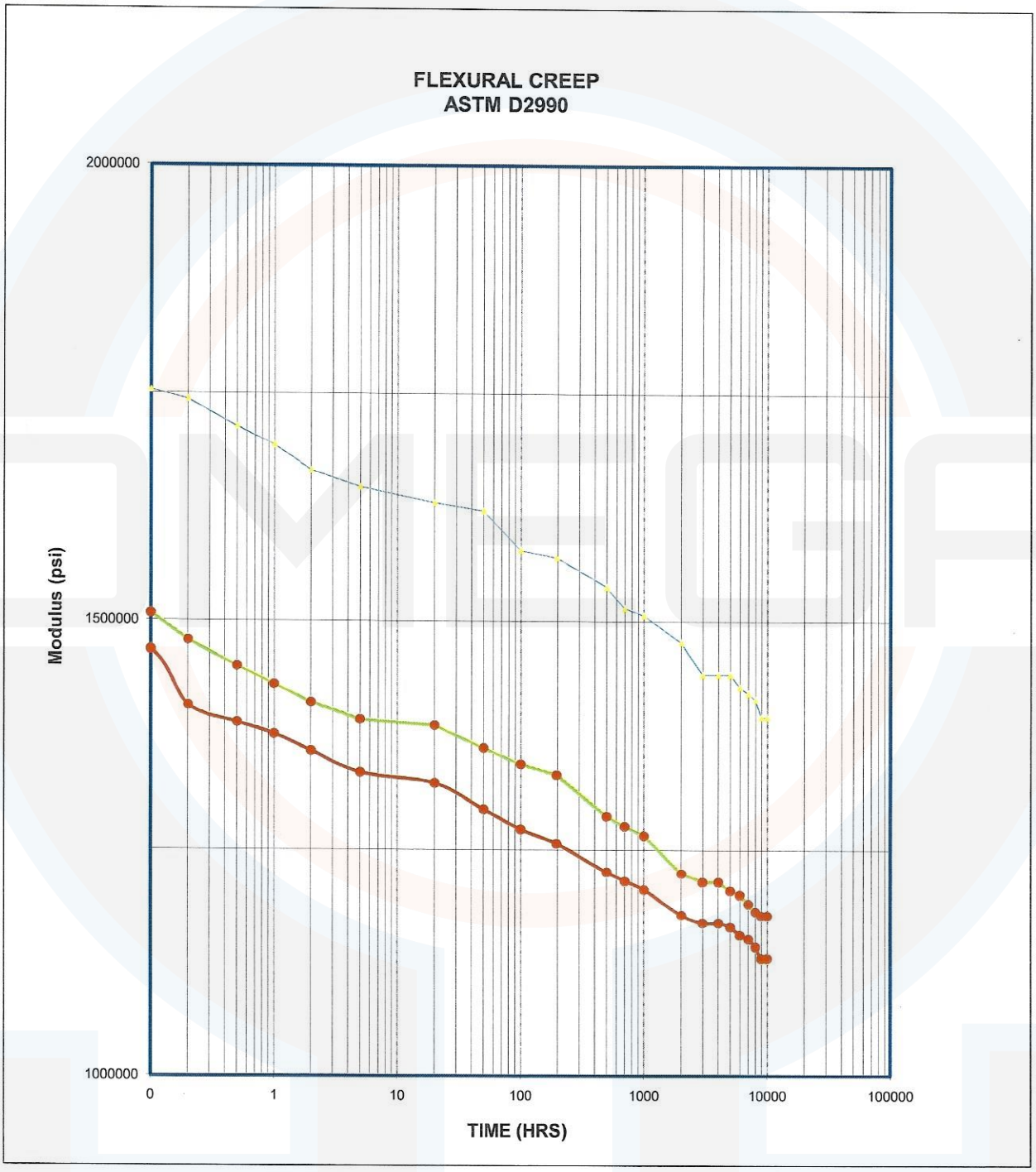

Project Name: *Omega Lining*
Project No.:
Sample ID No.: 2
Test Started: 7/19/18
Test Ended: 9/09/19
HTS Report#: OLF818.009B

Tested Temperature: 71°F
Lab Humidity: 50%
Specimen Gage Length: 2.3"
Stress: 5000 PSI

Sample ID: 2

Spec# 1	Stress: 5000 psi	Spec# 2	Stress: 5000 psi	Spec# 3	Stress: 5000 psi
Thickness: 0.144"	Width: 2.111"	Thickness: 0.145"	Width: 2.116"	Thickness: 0.147"	Width: 2.109"

TIME (HRS)	Modulus (psi)	TIME (HRS)	Modulus (psi)	TIME (HRS)	Modulus (psi)
0.02	1628374	0.02	1512552	0.02	1764039
0.10	1508051	0.10	1468710	0.10	1753723
0.20	1478909	0.20	1407514	0.20	1743527
0.50	1450873	0.50	1388233	0.50	1713638
1	1430534	1	1375670	1	1694275
2	1410757	2	1357245	2	1666037
5	1391519	5	1333434	5	1647729
20	1385223	20	1321839	20	1629819
50	1360597	50	1293715	50	1621009
100	1342694	100	1272063	100	1578351
196	1331019	196	1256293	196	1570087
500	1286278	500	1225899	500	1537880
700	1275559	700	1216092	700	1514579
1004	1265018	1004	1206440	1004	1506968
2012	1224537	2012	1178384	2012	1477274
3000	1214818	3000	1169319	3000	1441763
4004	1214818	4004	1169319	4004	1441763
5013	1205253	5013	1164839	5013	1441763
6000	1200527	6000	1155981	6000	1428032
7004	1191184	7004	1151602	7004	1421264
7996	1181986	7996	1142944	7996	1414560
9000	1177439	9000	1130197	9000	1394821
10005	1177439	10005	1130197	10005	1394821

HTS, INC. Consultants

HTS Pipe Consultants, Inc.
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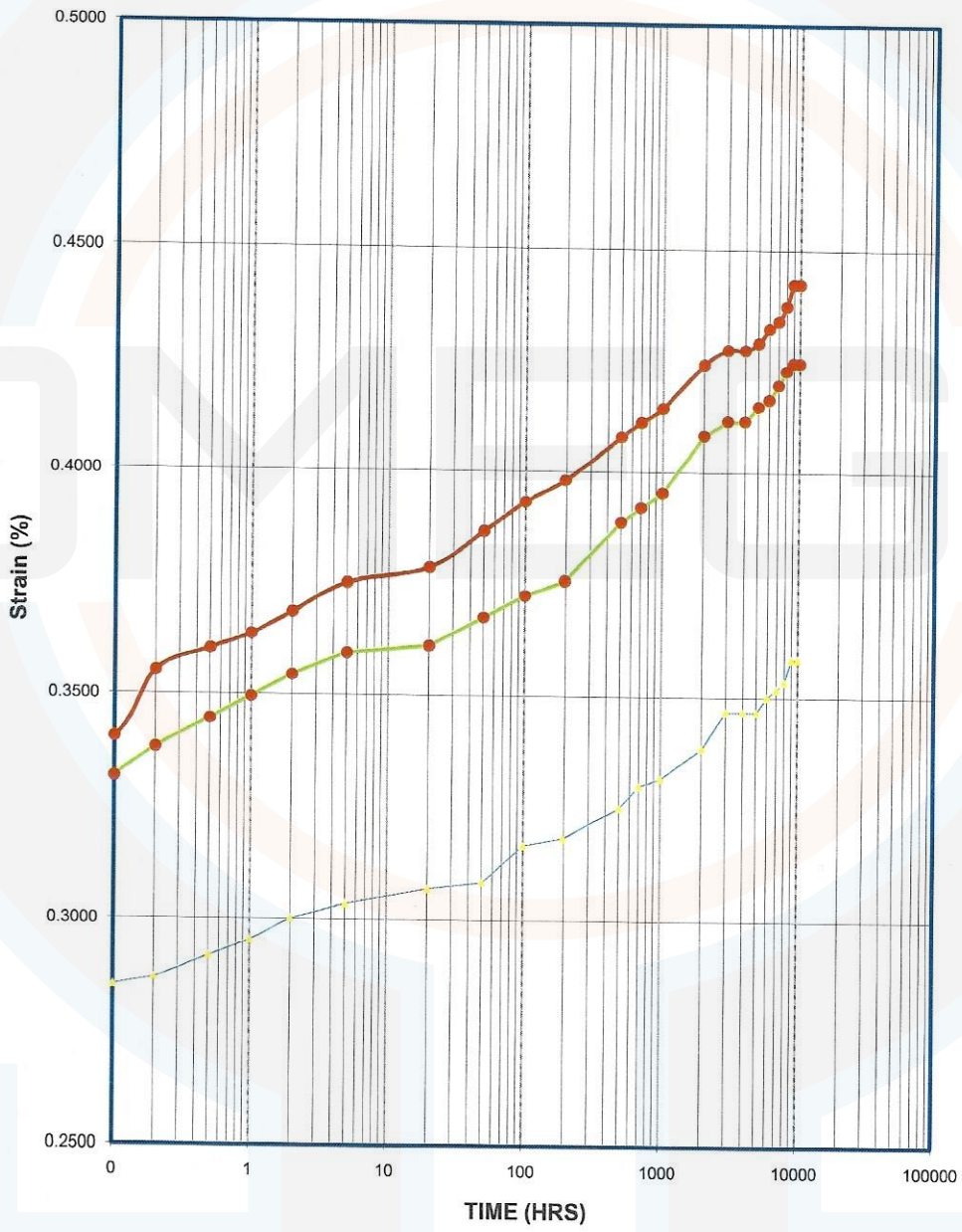
FLEXURAL CREEP
ASTM D2990



Project Name: *Omega Lining*
Project No.:
Sample ID No.: 2
Test Started: 7/19/18
Test Ended: 9/09/19
HTS Report#: OLF818.009B

Tested Temperature: 71°F
Lab Humidity: 50%
Specimen Gage Length: 2.3"
Stress: 5000 PSI

Sample ID: 2

Spec# 1	Stress: 5000 psi	Spec# 2	Stress: 5000 psi	Spec# 3	Stress: 5000 psi
Thickness: 0.144"	Width: 2.111"	Thickness: 0.145"	Width: 2.116"	Thickness: 0.147"	Width: 2.109"

TIME (HRS)	Strain (%)	TIME (HRS)	Strain (%)	TIME (HRS)	Strain (%)
0.02	0.3071	0.02	0.3306	0.02	0.2834
0.10	0.3316	0.10	0.3404	0.10	0.2851
0.20	0.3381	0.20	0.3552	0.20	0.2868
0.50	0.3446	0.50	0.3602	0.50	0.2918
1	0.3495	1	0.3635	1	0.2951
2	0.3544	2	0.3684	2	0.3001
5	0.3593	5	0.3750	5	0.3034
20	0.3610	20	0.3783	20	0.3068
50	0.3675	50	0.3865	50	0.3084
100	0.3724	100	0.3931	100	0.3168
196	0.3757	196	0.3980	196	0.3185
500	0.3887	500	0.4079	500	0.3251
700	0.3920	700	0.4112	700	0.3301
1004	0.3953	1004	0.4144	1004	0.3318
2012	0.4083	2012	0.4243	2012	0.3385
3000	0.4116	3000	0.4276	3000	0.3468
4004	0.4116	4004	0.4276	4004	0.3468
5013	0.4149	5013	0.4292	5013	0.3468
6000	0.4165	6000	0.4325	6000	0.3501
7004	0.4198	7004	0.4342	7004	0.3518
7996	0.4230	7996	0.4375	7996	0.3535
9000	0.4247	9000	0.4424	9000	0.3585
10005	0.4247	10005	0.4424	10005	0.3585

Omega Liner Company
Quality System Overview

CERTIFICATE OF REGISTRATION

QUALITY SYSTEMS REGISTRARS

THE FIRST ANAB ACCREDITED REGISTRAR ESTABLISHED 1991

This is to certify that the management system of:

Omega Liner Company

Client Number: 2019-038
515 Noid Road
Canton, SD 57013

Has been assessed and certified as meeting the requirements of:

ISO 9001:2015

This certificate of registration remains valid subject to satisfactory surveillance audits for the following activities:

Sales and customer service, purchasing, receiving, manufacturing, warehousing and distribution of underground liners.

Standard	***Certificate Number***	***Certified Since***
ISO 9001:2015	QSR-1135	8/23/2022
Date Issued	***Certification Date***	***Valid Until***
8/2/2022	8/23/2022	8/22/2025

ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17021-1 MANAGEMENT SYSTEMS CERTIFICATION BODY

MEMBER OF MULTILATERAL RECOGNITION ARRANGEMENT IAF

CAROL L. TILLMAN
VICE PRESIDENT

CT-9001-14001-45001 REV06222022
5045 HIGHWAY 162, HOLLYWOOD, SOUTH CAROLINA 29449 | (703) 478-0241 | QSR.COM

CERTIFICATE OF CONFORMITY

THIS CERTIFICATE STATES THAT OMEGA LINER COMPANY, INC. CONFORMS TO:

ASTM F2019

ASTM F1216

Mark Hallett

MARK HALLETT
DIRECTOR OF SALES

09/08/2022

DATE