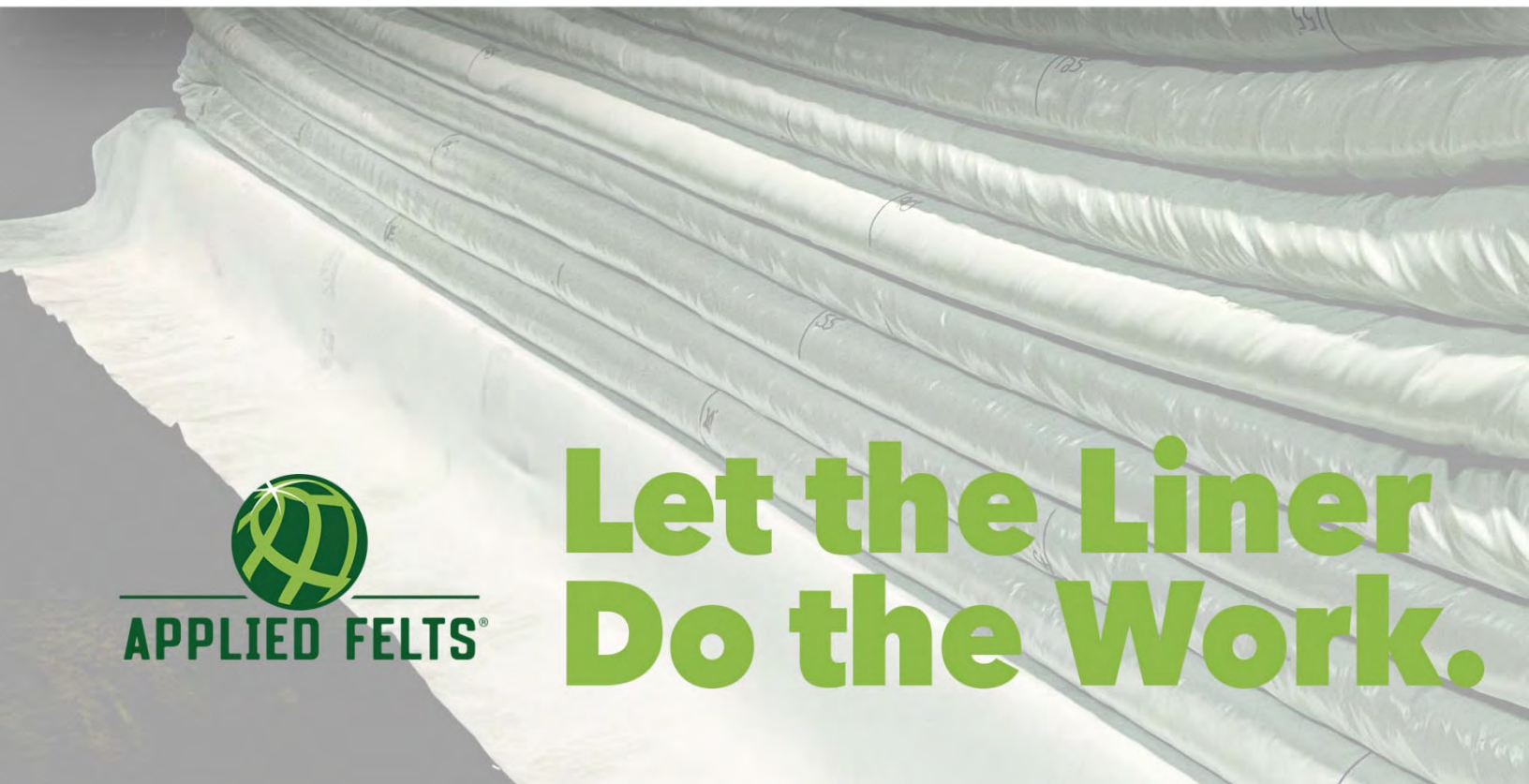




# EnviroCure<sup>®</sup>

## Testing Report



# Let the Liner Do the Work.



## ENVIROCURE®: TEST RESULTS: MULTIPLE INSTALLATIONS

### PRODUCT DESCRIPTION

EnviroCure® is a heat cure, STYRENE IMPERMEABLE polymer coating that eliminates styrene emissions and odor. EnviroCure® is manufactured by Applied Felts, Inc. and wet-out by FerraTex Solutions.

Styrene vapors are emitted during a cured-in-place pipe (CIPP) installation. These vapors can rise out of the sewer pipes and into the environment surrounding the installation sites. After the tube is cured the styrene should go away, so any exposure to styrene should be short-term. Testing on the EnviroCure® product was conducted during multiple installations in consideration of the guidelines set forth by the agencies listed in **Table 1** below.

**Table 1**

AGENCY	PPM LIMITS	LENGTH OF TIME	NOTES
United States Environmental Protection Agency (EPA) – Styrene Interim AEGL	< 20 ppm	more than 1 hr	General public
National Institute for Occupational Safety and Health (NIOSH)	< 50 ppm	10 hr work day	Workers
Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELs)	< 100 ppm	8 hr work day	OSHA PEL TWA
	< 200 ppm; <600 ppm	(Peak) for a single time period up to 5 min in any 3 hrs	OSHA C
American Conference of Governmental Industrial Hygienists (ACGIH®) Threshold Limit Values (TLVs®)	<10 ppm	8 hrs	ACGIH® TLV-TWA
	<20 ppm	15 mins	ACGIH® TLV- STEL

**PPM** = Parts Per Million

**TWA** = Time Weighted Average

**STEL** = Short Term Exposure Limits

**C** = Ceiling Concentration



# EnviroCure® Installation - Indianapolis, Indiana

## SUMMARY

In October of 2021 an analysis was performed to measure the styrene concentration during a CIPP installation process in a residential area of Indianapolis, Indiana. The air testing was performed using a Dräger XPID 8500 monitoring system on 4 different line segments with the use of pre-liner in 2 of the segments. Results of the testing are presented in **Tables 2 – 5** below.

**Table 2 - Indianapolis, IN 12" EnviroCure® Installation WITHOUT Pre-liner**

Location	Distance (ft)	Styrene (PPM)	Process	Notes
Trailer	0	.69	12" Installation	
Trailer	0	0		
Invert End	5	0	12" Heating/Cooking	Head wind present
Invert End	15	0		
Invert End	15	0		
Clean Out	5	0		
Tail End	5	0		
Tail End	10	1.12		
Tail End	15	0		
Tail End	3	0	12" Cooling	
Invert End	0	0		
Clean Out	3	0		
Tail End	3	0		
Inside of CIPP	0	0		

**Table - 3 Indianapolis, IN 24" EnviroCure® Installation WITHOUT Pre-liner**

Location	Distance (ft)	Styrene (PPM)	Process	Notes
Trailer	0	10.1	24" Installation	Water added for cooking
Trailer	0	0		
Invert End	0	0		
Invert End	5	0.74	24" Heating/Cooking	When temperature reached 198F Ground level - Manhole opening When temperature reached 137.9F Breathing level 5ft away at height of 5ft When temperature reached 137.9F When temperature reached 198F When temperature reached 198F
Invert End	10	0		
Invert End	10	1.44		
Tail End	0	19		
Tail End	3	8.55		
Tail End	5	0		
Tail End	5	1.94		
Tail End	5	3.39		
Tail End	10	0		
Tail End	3	0	12" Cooling	
Invert End	0	0		
Clean Out	3	0		
Tail End	3	0		
Inside of CIPP	0	0		

**Table 4 - Indianapolis, IN 12" EnviroCure® Installation WITH Pre-liner**

Location	Distance (ft)	Styrene (PPM)	Process	Notes
Trailer	0	0	12" Installation	After installation
Invert End	5	0		
Invert End	10	0		
Tail End	0	0.65		
Tail End	5	0		
Tail End	5	2.12		
Tail End	5	0		
Tail End	10	0		
Inside CIPP	0	1.03	12" Heating/Cooking	192F right outside CIPP end
Invert End	5	0		Visible steam
Invert End	5	0		
Invert End	10	1.08		At start of cooking
Invert End	10	0		Head wind visible steam
Invert End	10	0		
Invert End	10	0		
Invert End	15	0		
Clean Out	0	20.6		Right above opening
Clean Out	5	0		180F steam visible
Clean Out	5	0		
Tail End	0	8.42		
Tail End	0	3.74		
Tail End	5	8.61		
Tail End	5	0		
Tail End	5	1.34		
Tail End	5	1.13		
Tail End	10	0		
Tail End	10	0.88		
Tail End	10	0		179F visible steam
Tail End	15	3.18	191F	
Tail End	15	0	159F	
Tail End	15	0	191F	
Invert End	5	0	12" Cooling	
Clean Out	5	5.6		
Tail End	5	0		
Tail End	10	0		

**Table 5 - Indianapolis, IN 24" EnviroCure® Installation WITH Pre-liner**

Location	Distance (ft)	Styrene (PPM)	Process	Notes
Invert End	0	0	24" Installation	
Invert End	0	0		
Tail End	0	0		
Invert End	0	0.48	24" Heating/Cooking	Temperature at 140F
Invert End	0	7.45		Visible steam
Invert End	5	0		
Invert End	5	0		
Invert End	5	0		Visible steam with head wind
Invert End	5	0.67		Before cooldown
Invert End	10	0		
Invert End	15	0		Head wind present
Invert End	25	1.1		No wind - before cooldown
Clean Out	0	0		
Clean Out	5	0		
Tail End	0	0.64		In visible steam
Tail End	2	0		
Tail End	5	8.61		In steam flume
Tail End	5	0		140F temperature
Tail End	5	0		142F
Tail End	10	7		110F
Tail End	25	0		138F - 1hr after heating
Tail End	25	0.47		157F In visible steam
Tail End	25	0		
Tail End	25	0.75	159F	
Invert End	0	0	24" Cooling	
Invert End	5	0		
Invert End	25	0		
Clean Out	0	0		
Tail End	25	0		142F

**CONCLUSION:**

The styrene concentration measurements for EnviroCure® never went above the 20 ppm threshold as per EPA standard except during the heating and cooling of the 12" and 24" WITH pre-liner at the tail end and the clean out. Within 2 minutes of each of those readings the concentration of styrene registered 0 ppm. These measurements suggest a low risk level for the use of the EnviroCure® product with or without the use of pre-liner during the CIPP process.

**EnviroCure® Installation – Fairfax County, Virginia**

**SUMMARY**

In November of 2021 an industrial hygiene monitoring study was done to record the chemical exposure of workers during the relining of an 8" line segment in a residential area of Fairfax County, Virginia. Personal exposure air samples were collected by attaching an Assay N525 passive organic vapor monitor on the worker’s shirt collar in their breathing zone (within a 10" radius of nose and mouth). The method of testing used was the National Institute for Occupational Safety and Health (NIOSH) 1051; Gas Chromatography with Flame-Ionized Detection (GC/FID). Results of the testing is presented in Table 6 below.



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**Table 6 - Fairfax County, VA EnviroCure® 8" Installation Air Exposure Summary**

Employee/Area Sampled	Distance (ft)	
	Styrene Concentration	
	8 hr TWA	15 min STEL
Upstream Manhole (MH #1)	<0.2 ppm	-
Back of refrigeration Truck (STEL during opening of door)	<0.2 ppm	<1 ppm
Employee 1	0.16 ppm	-
Employee 2 (STEL during line cutting)	0.16 ppm	<1 ppm
Employee 3 (STEL during line cutting)	0.18 ppm	<1 ppm
Employee 4	0.21 ppm	-
Employee 5	0.10 ppm	-
Upstream Manhole # 1 (STEL during line inversion)	<0.06 ppm	<1 ppm
Downstream Manhole #2	1.55 ppm	-
Approximate 15' perimeter of stream vent exhaust	0.29 ppm	-
Back of refrigeration Truck (STEL during opening of door)	0.07 ppm5	<1 ppm

In addition to the air exposure testing on the workers, incidental direct readings of field activities throughout the day were conducted for total volatile organic compounds (TVOCs) using a pre-calibrated photoionization detector (PID) outfitted with a 10.6 electron vole (eV) lamp. A correction factor (CF) for styrene of 0.4 was used to determine the adjusted value of the reading based on the PID calibration in isobutylene equivalents and a 10.6 eV lamp. The results from these readings are presented in **Table 7** below.

**Table 7 - Fairfax County, VA EnviroCure® 8" Installation Field PID Reading Summary**

Field Activity & Area Sampled	2 Minute Peak Styrene PID Reading (PPM)
Back of truck - opening of door	0.1
Back of truck/upstream manhole - during liner prep	0.3
Back of truck/upstream manhole - during liner inversion	1
Back of truck - opening of door	0.1
Back of truck/upstream manhole - during liner prep	0.2
Back of truck/upstream manhole - during liner inversion	1.1
Upstream manhole opening - during curing process	3.6
Downstream manhole opening - during curing process	108
15' downwind radius of steam exhaust - during curing process	3
Upstream manhole opening - during line cutting	0.9
Downstream manhole opening - during line cutting	0.1

**CONCLUSION:**

Based on the results, none of the personal or ambient air badge samples were below the OSHA and ACGIH occupational exposure limits. Direct peak PID readings for styrene concentrations collected during other key exposure activities (example: opening of refrigerated truck, liner preparation, liner inversion, liner cutting) ranged from 0.0 – 2.7 ppm.



**Contact Details**

As seen in the testing performed on EnviroCure®, air exposure concentrations for styrene during preparation and installation of the CIPP liners were below the OSHA PELs and ACGIH TLVs. Employee and personnel ambient air badge samples surpassed the applicable occupational exposure limits.

# Your Answer to CIPP Styrene Emissions

EnviroCure reduces styrene emissions to  
less than 1 part per billion\*



**APPLIED FELTS**  
YOUR SUCCESS IS OUR SUCCESS

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