

An Emerging Issue: Chemical Exposures & Public Safety Near Water Repair Sites



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PURDUE
UNIVERSITY

April 10, 2018

Association of State and Territorial Health Officials

All information can be found online at
<http://www.CIPPSafety.org>

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ENVIRONMENTAL
Science & Technology **LETTERS**

Worksite Chemical Air Emissions and Worker Exposure from Sanitary Sewer and Stormwater Pipe Rehabilitation Using Cured-in-Place-Pipe (CIPP)


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Cured-in-Place Pipe Safety Study



News In the News

Scientific report files & associated video files, *Environmental Science & Technology Letters*, July 2017

Frequently Asked Questions (FAQ)

- General Questions
- What Can I Do?
- Questions about Chemicals in the Air, in Building, and Exposure
- Questions about CIPP Technology
- Worker Safety

[Incorrect assertions about the CIPP study](#)

In 2016, Purdue researchers began investigating chemical emissions and exposures caused by cured-in-place-pipe (CIPP) water pipe repair sites. CIPP is the most popular water pipe repair technologies used in the U.S. Because this technology uses raw chemicals in the field and manufacturers a new plastic pipe inside an existing damaged water pipe, chemicals can be emitted into the environment and enter nearby buildings. CIPP is used for sanitary sewer, storm sewer, and drinking water pipe repairs.

Questions? Contact us at CIPPSafety@purdue.edu

Visit <https://engineering.purdue.edu/CIPPSafety>

- ✓FAQs
- ✓Links to studies
- ✓Links to resources

Today, Cured-in-Place-Pipe (CIPP) Technology is one of the most popular water pipe repair methods

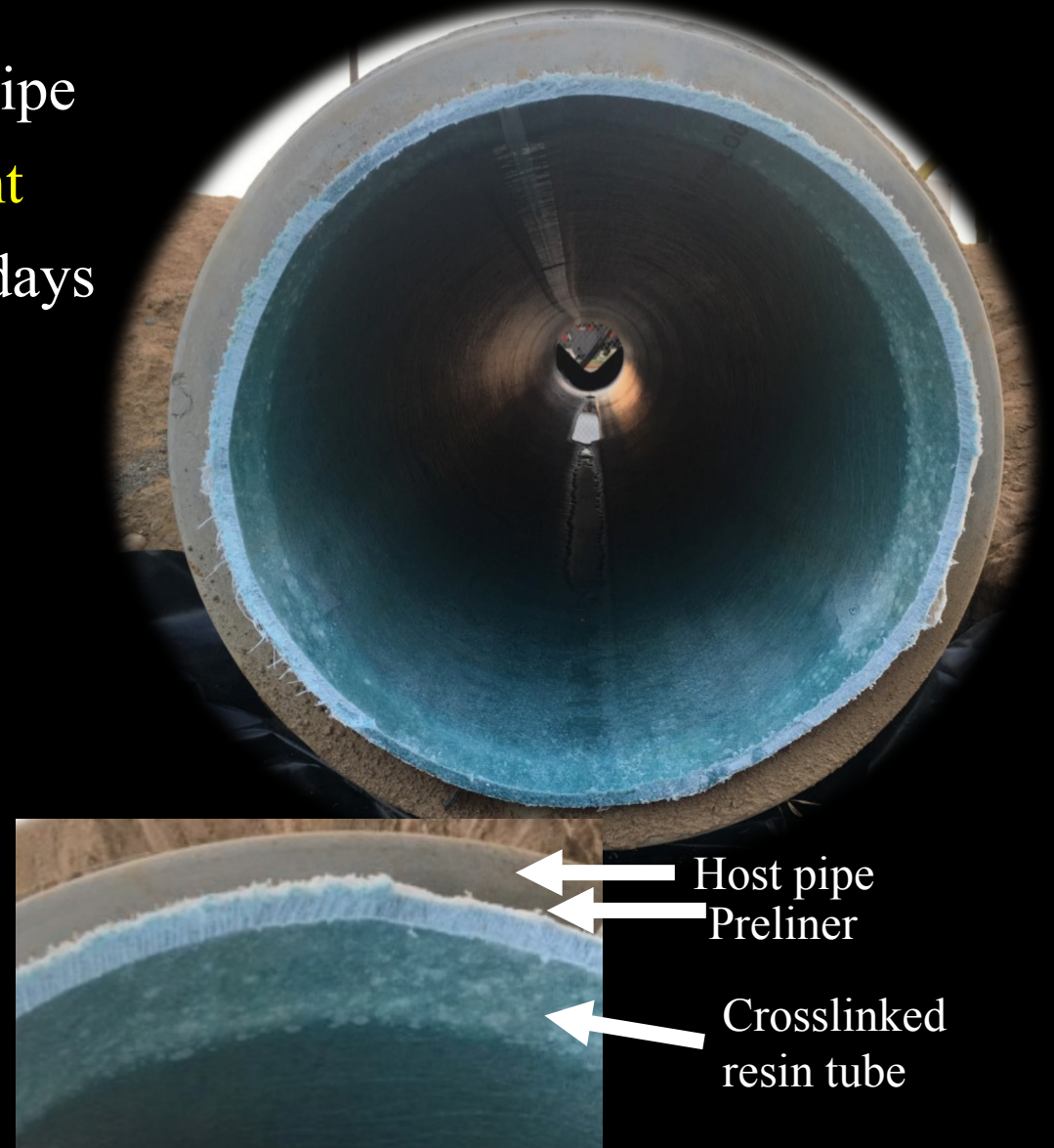
Resin impregnated tube hardened inside a broken pipe

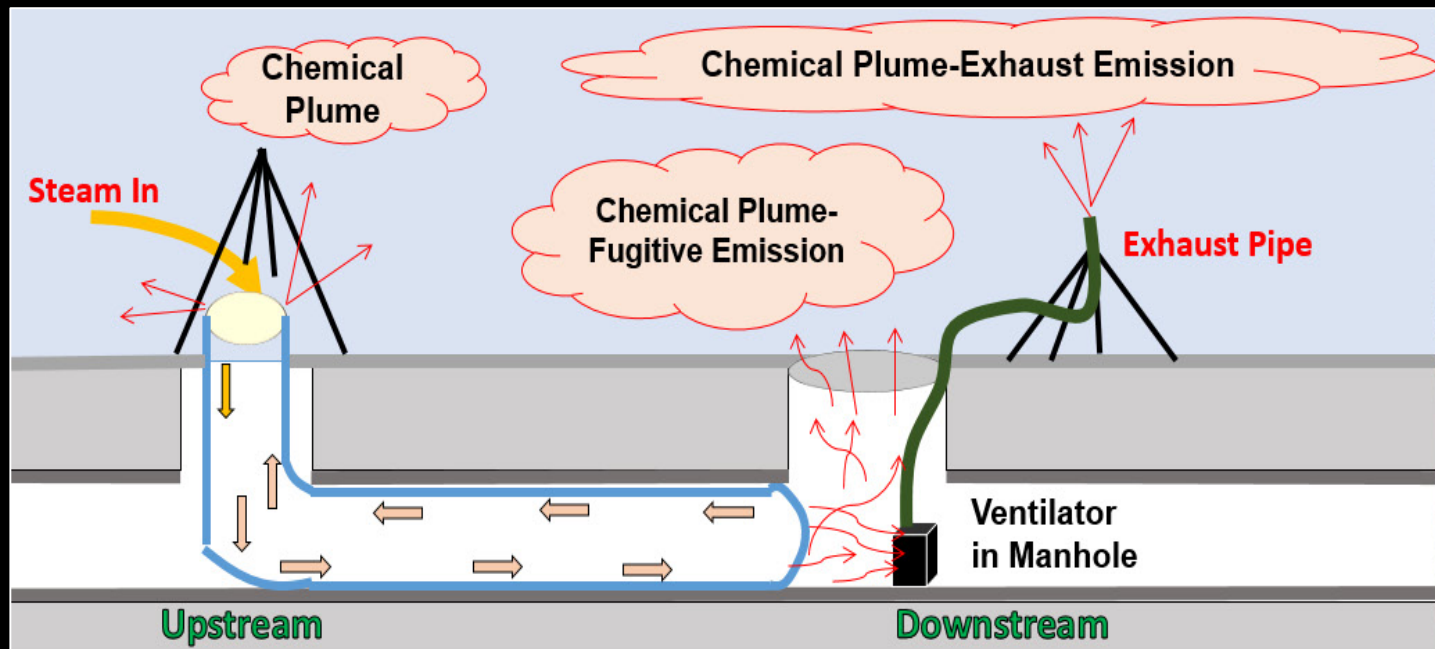
Curing methods: Hot water, Steam, UV light

Deliberate curing time: Hours to many days

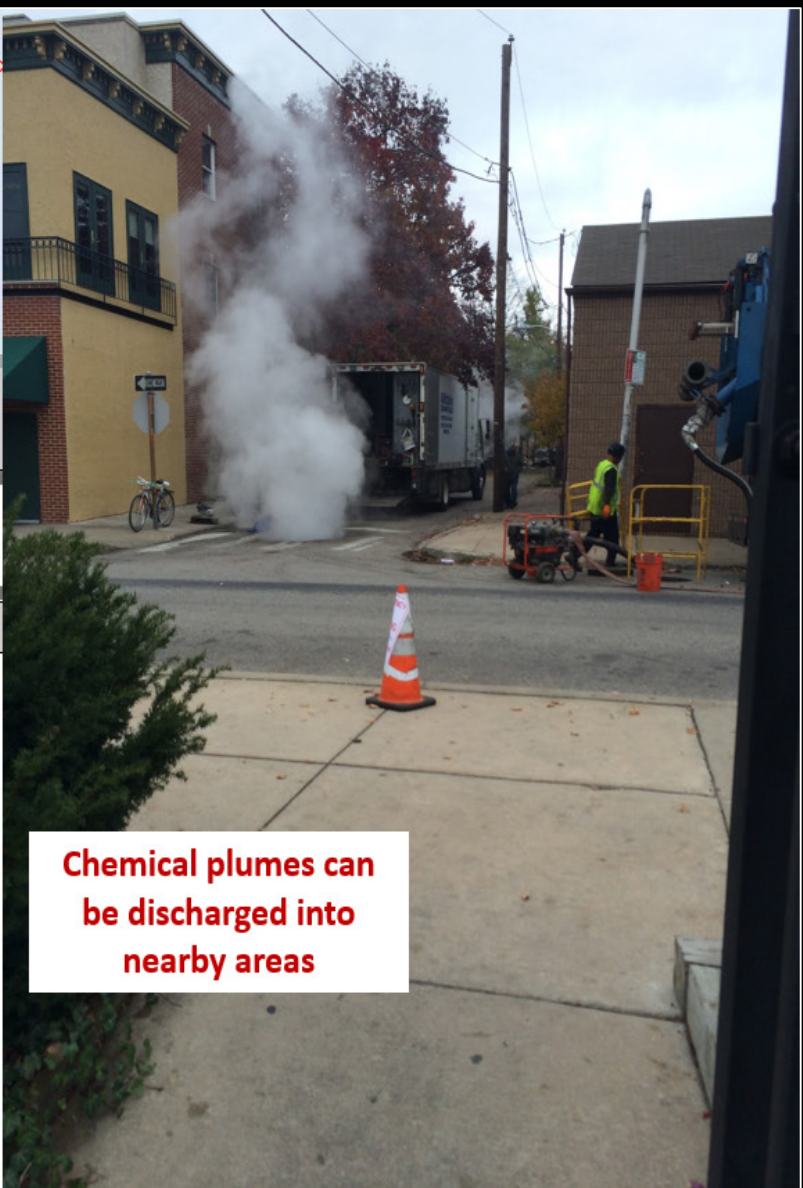
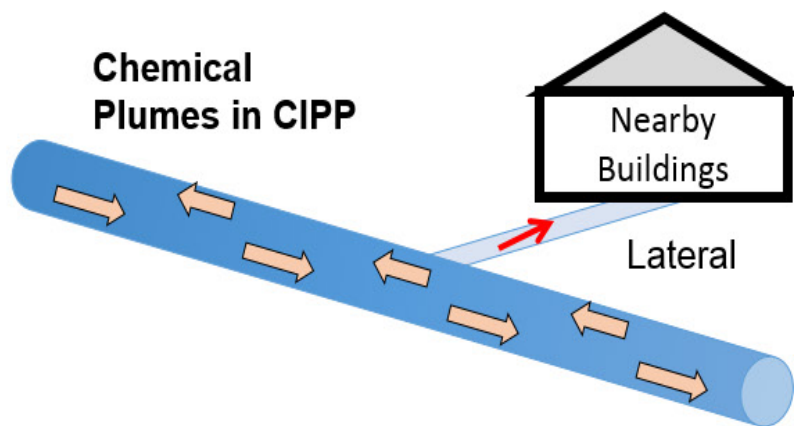


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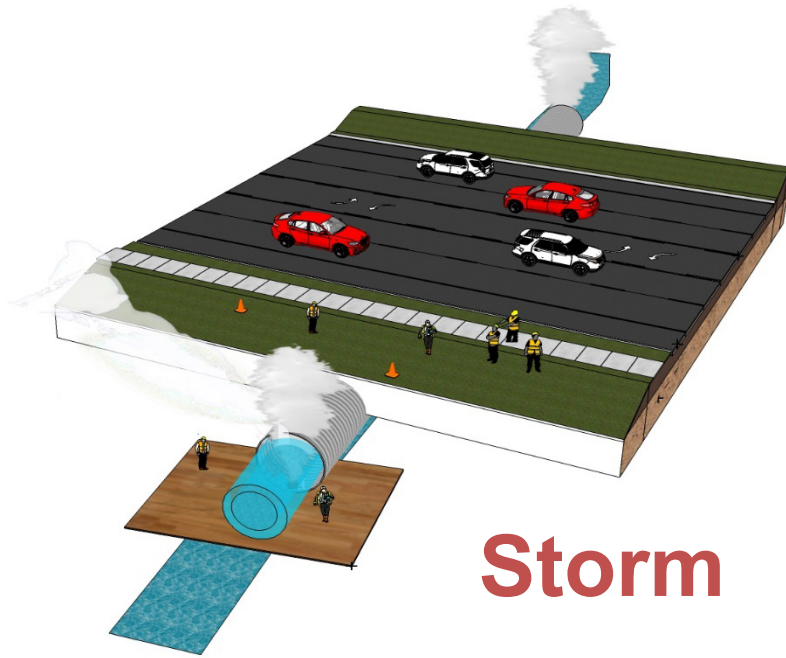




Chemical Plumes Generated by CIPP can Escape the Pipe Being Repaired



Chemical plumes can be discharged into nearby areas



We found 59 building air contamination incidents

Daycares, schools, residences, offices

Sometimes medical assistance applied onsite

Some persons sent to hospital

Onsite PID monitoring = up to 500 ppm styrene

Information distributed to the public:

“50 ppm styrene is the safe exposure level”

“styrene vapor of at most few ppm”

“is not a human health risk”

“is safe for people and animals”

“it is harmless steam”

“don’t be alarmed”

“open windows to allow ventilation”



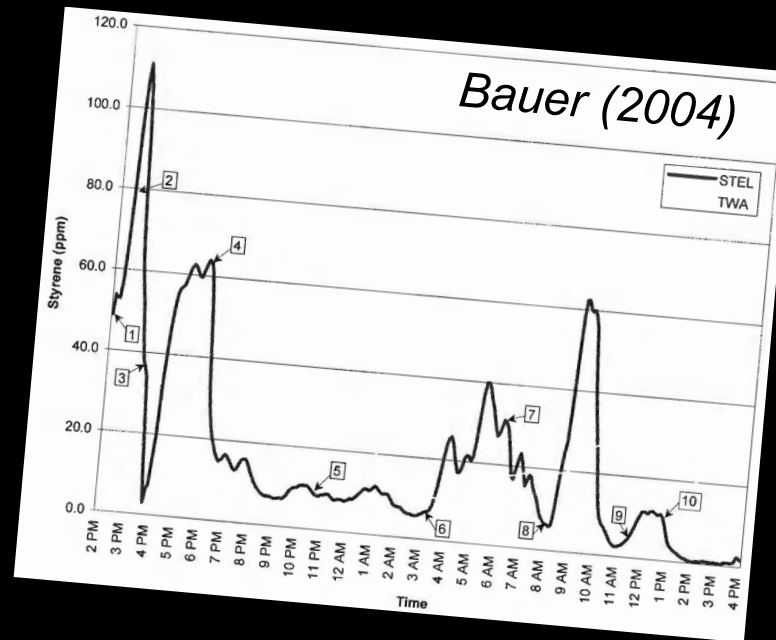
As of 2017, only 4 CIPP air monitoring studies were found for the past 16 years

A Report on the Monitoring of Styrene in Toronto Homes During the Cured in Place Pipe (CIPP) Process for Sewer Pipe Rehabilitation by Insituform

PROJECT NO. 041-6742

AirZone, Inc. (2001)
Up to 3.2 ppm styrene

Prepared for
Toronto Works & Emergency Services
2700 Eglinton Avenue West
Toronto, Ontario
M6M 1V1



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Spring 5-13-2016

Volatile Organic Compound (VOC) Emission during Cured-in-Place-Pipe (CIPP) Sewer Pipe Rehabilitation

Elena Bourbour Ajdari
University of New Orleans, ajdari.e@gmail.com

Univ. New Orleans (2015)
Up to 1,070 ppm styrene

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Recommended Citation

Bourbour Ajdari, Elena, "Volatile Organic Compound (VOC) Emission during Cured-in-Place-Pipe (CIPP) Sewer Pipe Rehabilitation" (2016). University of New Orleans Theses and Dissertations. 2126.
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Health Consultation

SCHLITZ PARK OFFICE BUILDING
MILWAUKEE, MILWAUKEE COUNTY, WISCONSIN

SEPTEMBER 13, 2005

ATSDR (2005)

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

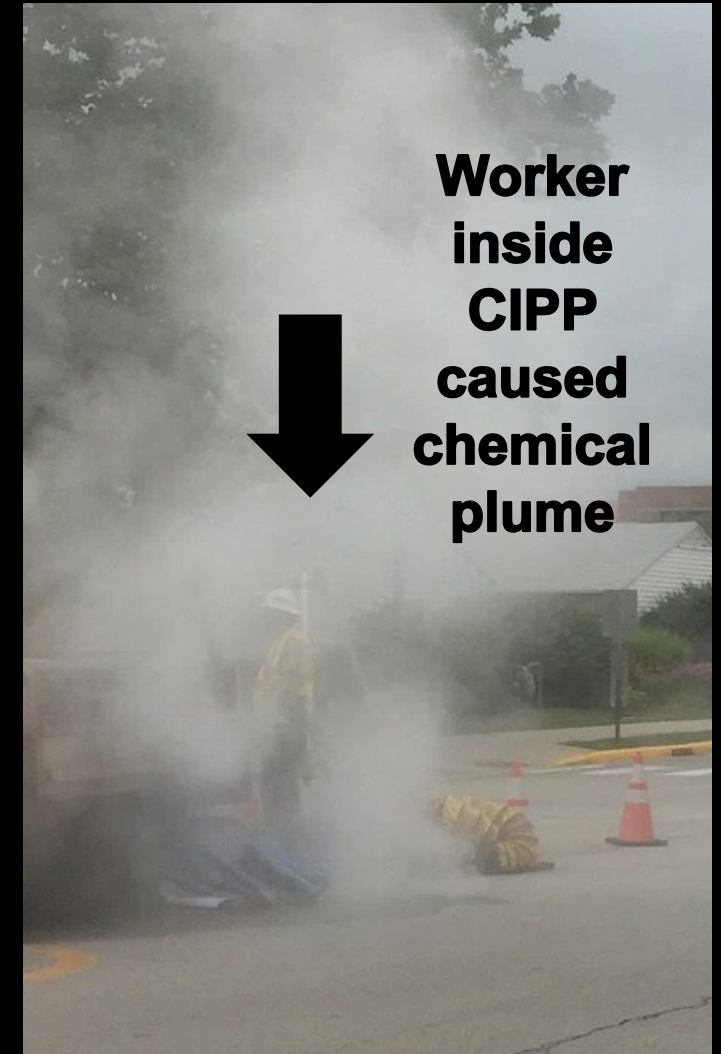


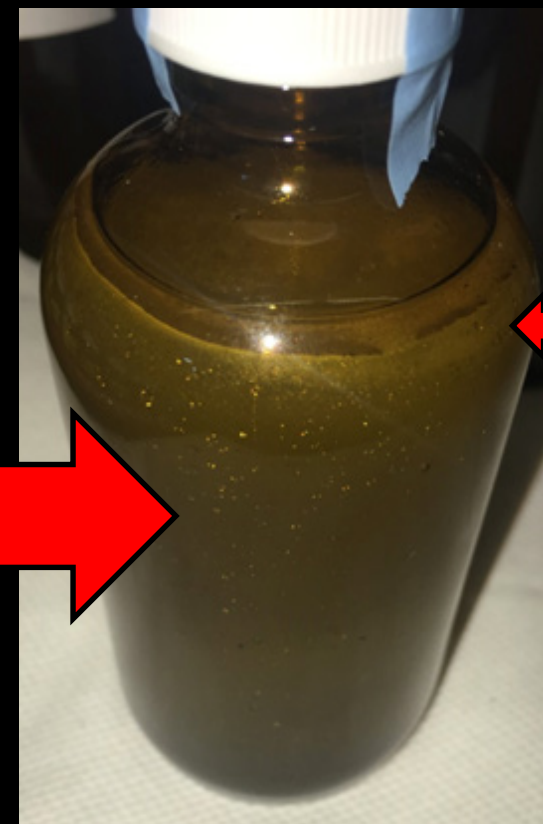
NSF RAPID Response Study

To better understand materials emitted from CIPP sanitary sewer pipe and storm water pipe repair installations and their potential toxicity

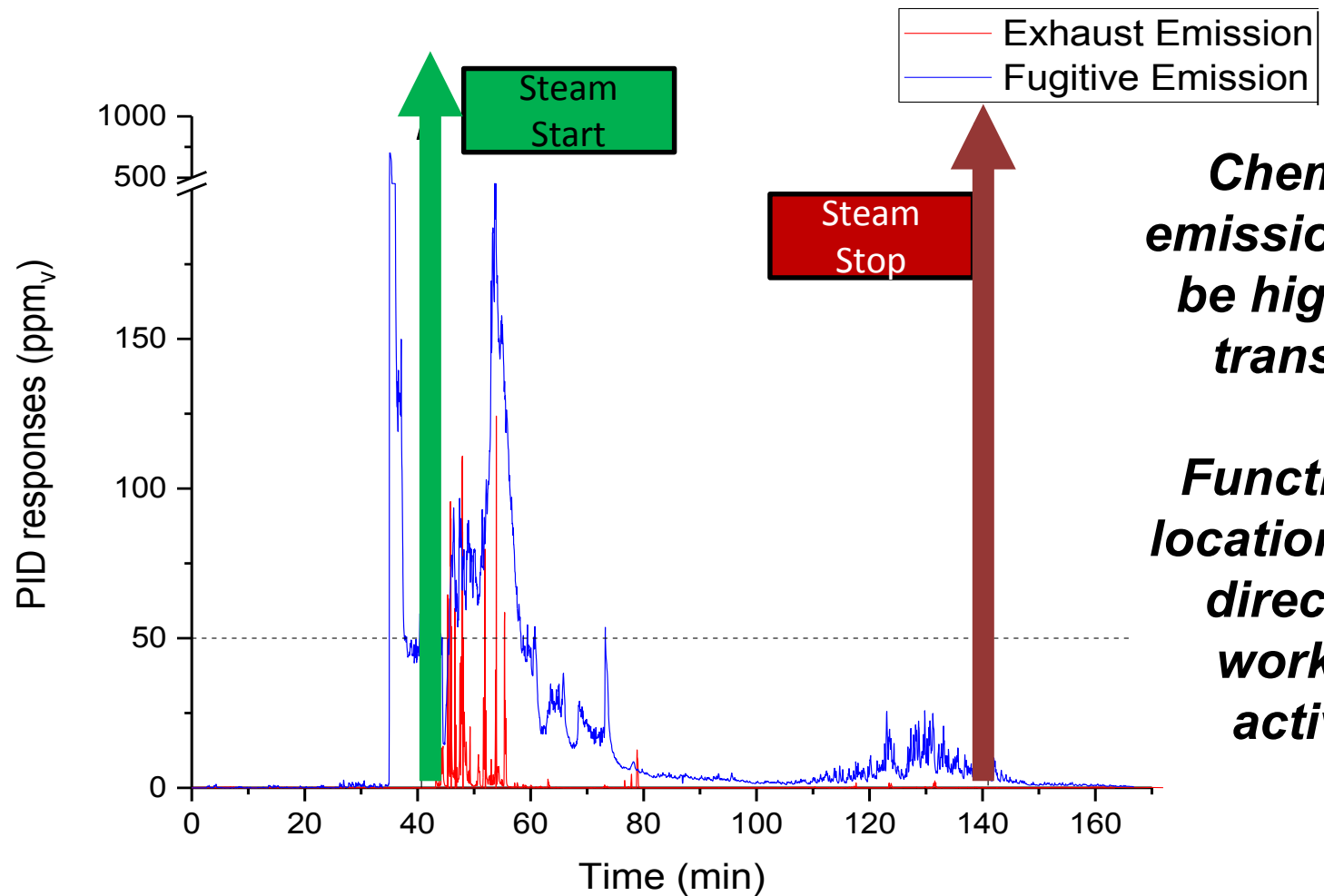
2017 Study Objectives

- 1) Conduct air sampling and analysis for 7 steam CIPP installation sites that use non-styrene and styrene resins
- 2) Characterize the raw materials, materials emitted, and their magnitudes
- 3) Evaluate chemical plume toxicity to mouse lung cells
- 4) Identify worksite safety issues and provide recommendations on future technology use





This is a Multiphase Chemical Mixture, **NOT Steam**
(particulates, droplets, partially cured resin, etc.)

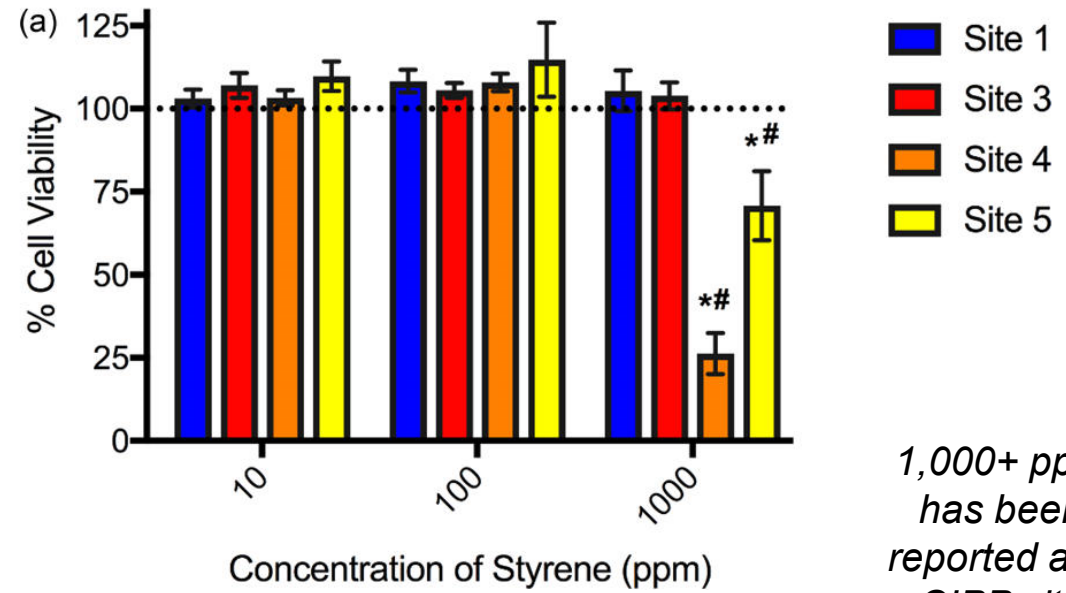


***Chemical
emissions can
be high and
transient***

***Function of
location, wind
direction,
worksite
activity***

Some Compounds Identified

Acetone
Acetophenone
Benzaldehyde
Benzoic acid
BHT
4-*tert*-Butylcyclohexanone
4-*tert*-Butylcyclohexanol
Dibutyl phthalate
Phenol
Styrene
1-Tetradecanol
TPGDA
1-Dodecanol



Mouse lung cell experiments indicated that toxicity occurred and future health impact investigations are necessary

Recommendations

- (1) Minimize dermal and inhalation exposures
- (2) Monitor emissions
- (3) Use appropriate personal protective equipment (PPE)
- (4) Capture emissions and confirm this by monitoring

What Can I Do?

- CIPP Companies
- Members of the Public
- Health Departments
- Worker Safety Agencies
- Municipalities, Utilities, Engineering Companies
- Fire Departments

<http://www.CIPPSafety.org>

HEALTH PROFESSIONALS HAVE A CRITICAL ROLE IN PROTECTING PUBLIC SAFETY AND WORKER HEALTH

**Health professionals should learn about
CIPP technology, emissions, and how to
investigate and respond to incidents**

CURED-IN-PLACE-PIPE (CIPP)

Employees OR Employers OR Unions OR Health Depts should Request -FREE- Help from NIOSH

National Institute of Occupational Safety and Health

Right now you can...

- Request feedback about what PPE to wear
- Request a -FREE- Health Hazard Evaluation from NIOSH

Health Hazard Evaluations help workers learn what health hazards are present at their workplace and recommends ways to reduce hazards and prevent work-related illness.

Request for a Health Hazard Evaluation

Form Approved
OMB No. 0920-0260
Exp. 11/30/2017

This form also is available at <http://www.cdc.gov/niosh/hhe/hheform.html>

Workplace Name _____

Workplace Address _____
Street City State Zip Code

What type of work is done at this location?
How many people work at this location?
☐ 3 or less ☐ 4-9 ☐ 10-49 ☐ 50-99 ☐ 100-249 ☐ 250 or more

Who is responsible for employee health and safety in this workplace?
Name _____ Title _____ Phone number _____

What hazardous substances, agents, or work conditions are of concern? If known, please include chemical names, trade names, manufacturer name, or other identifying information.

How are employees exposed?
☐ Breathing ☐ Skin Contact ☐ Swallowing ☐ Other (Explain : _____)

In what work area, such as a building or department, is the hazard? _____

How many people work in this area? ☐ 3 or less ☐ 4-9 ☐ 10-49 ☐ 50-99 ☐ 100-249 ☐ 250 or more
Describe the work people do in this area.

What health concerns do people in this work area have?

Information about you

Name (please print): _____

Address where we can send you information? _____
Street City State Zip Code

Phone number where you would like to be called: (____) _____
Best time to call: _____ a.m. or _____ p.m.

Email address where you would like to be contacted: _____

Can NIOSH reveal your name to your employer? ☐ No ☐ Yes

Requests can be made in writing or online:

<https://www.cdc.gov/niosh/hhe/hheform.html>

CONTACT THESE PEOPLE TO DISCUSS WHAT COULD BE INVOLVED:

Dr. Ryan LeBouf, CIH (igu6@cdc.gov)

Dr. Rachel Bailey (feu2@cdc.gov)

You can access FREE CIPP worker and public safety resources

CIPP SAFETY STUDY WEBINAR (Oct 2017)
[neha.http://neha.org/node/59333](http://neha.org/node/59333)



To help local, state, and county health professionals better understand public health and occupational exposures with CIPP. Results of a July 2017 Purdue University CIPP safety study were presented as well as lessons learned from a NIOSH workplace Health Hazard Evaluation, and options for health officials, agencies, companies, and workers to gain technical assistance.



Promoting productive workplaces through safety and health research / **NIOSH**



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News

updated: 10/26/2017 11:28 AM

Worker killed in Streamwood sewer line

Daily Herald



Illuminated by emergency lights and rescue lights, a man reacts after rescue crews pulled the body of a worker from a sewer line on South Park Boulevard in Streamwood Wednesday night.

John Starks | Staff Photographer

Worker and public safety at and near CIPP installation sites needs to be addressed.

OSHA Region 5
investigating

October 30, 2016

Reporters: Jake Griffin, Eric Petersen

Photo: John Starks, Daily Herald

Air contamination incidents we know about since our July 2017 study was published

[Undisclosed, CA](#) (emissions in home)

[Nyack, NY](#) (1 adult required oxygen in their home)

[Dublin, CA](#) (affected residences)

[Good Hope, IL](#) (affected post office)

[Lee's Summit, MO](#) (affected residences)

[Beaver, PA](#) (evacuated neighborhood)

[San Diego, CA](#) (36 elementary school children affected, 1 sent to hospital)


[New York City, NY](#) (Residents self-monitored, CIPP pause until further notice)

Table S1. List of reported CIPP caused air contamination incidents found by the authors and styrene concentration reported in air		
Information presented in the table is verbatim or summarized from the references; Table Notes: nr = Not reported in the reference; PERSONAL COMMUNICATION indicates the source contacted co-author Dr. Whelton individually; FOIA indicates records were obtained from a utility by a Freedom of Information Act (FOIA) records request; Information obtained from that request, where applicable, was described. FOIA requests were submitted to the following organizations based on input from CIPP industry representatives and author contacts: Bureau of Engineering, City of Los Angeles, CA; Orange County Sanitation District, Orange County, CA; St. Louis Metropolitan Sewer District, St. Louis, MO; Citizens Energy Group, Indianapolis, IN; City of Chicago Division of Water Management, Chicago, IL; DC Water, Washington, DC; Washington Suburban Sanitation Commission, Laurel, MD; Citizens Energy Group did not provide documents to the authors in response to their January 2017 FOIA request by the time this manuscript was submitted.		
Incident Location (Year)	Styrene	Description of events from reference
West Lafayette, IN (2016) ¹	nr	Fumes entered a University campus office building through floor drains; chemicals were generated by a nearby CIPP sewer pipe repair activity; building inhabitants complained to the University safety department and onsite CIPP contractor about odors; doors were opened to ventilate building before the safety department representative arrived to investigate; fire department was not called; University safety department conducted spot PID testing after building ventilation; contractor stated there was no health risk just an unpleasant odor.
Good Hope, IL (2016) ²	nr	Report that "steam" filled the post office four different times; no fire department called; lateral not plugged allowed chemical plume to enter building; "It blew the water out of the toilet," Town Manager said. "It blew the wax seal out because steam was coming out between the floor and the toilet, and steam was coming out of the toilet...and it was coming out of the roof vent. I came up here six times." I got phone calls from the post office out of Bloomington, out of La Harpe, out of Galesburg and like three times up here...The first time, it ruined their computer, and they had to replace their computer inside. It was so wet, there was water dripping from the ceiling. Everything in there was just covered, and the floors were just sopping wet."
Madison, WI (2016) ³	nr	Hazardous materials team responded; odor-permeating basements of local businesses and exiting storm drains; The reporter stated, "A white haze that was unidentifiable on monitoring equipment was seen coming out of a storm sewer drain, so firefighters called in the hazardous incident team. Chemical identified was styrene." "An employee of the CIPP company said they used styrene and the chemical had been disposed of in a drain about four blocks away," per the fire department.

WE PREVIOUSLY DESCRIBED 59 INCIDENTS IN THE SUPPORTING INFORMATION FILE

OPEN ACCESS: Teimouri et al. 2017. *Environ. Sci. Technol. Letters*

Get up to speed.
Improve public and worker safety as well as reduce environmental impacts.



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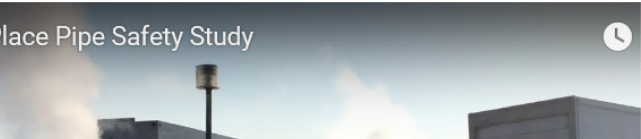
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Thank You. Please contact us if you have any questions.

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Results of another of our ongoing CIPP chemical emission studies to be available soon. Please visit our website.

<https://engineering.purdue.edu/CIPPSafety>