Communities Need Health Officials to Protect them from Neighborhood HAZMAT Incidents

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Visit www.CIPPSafety.org for more information

February 11, 2020

Association of State and Territorial Health Officials

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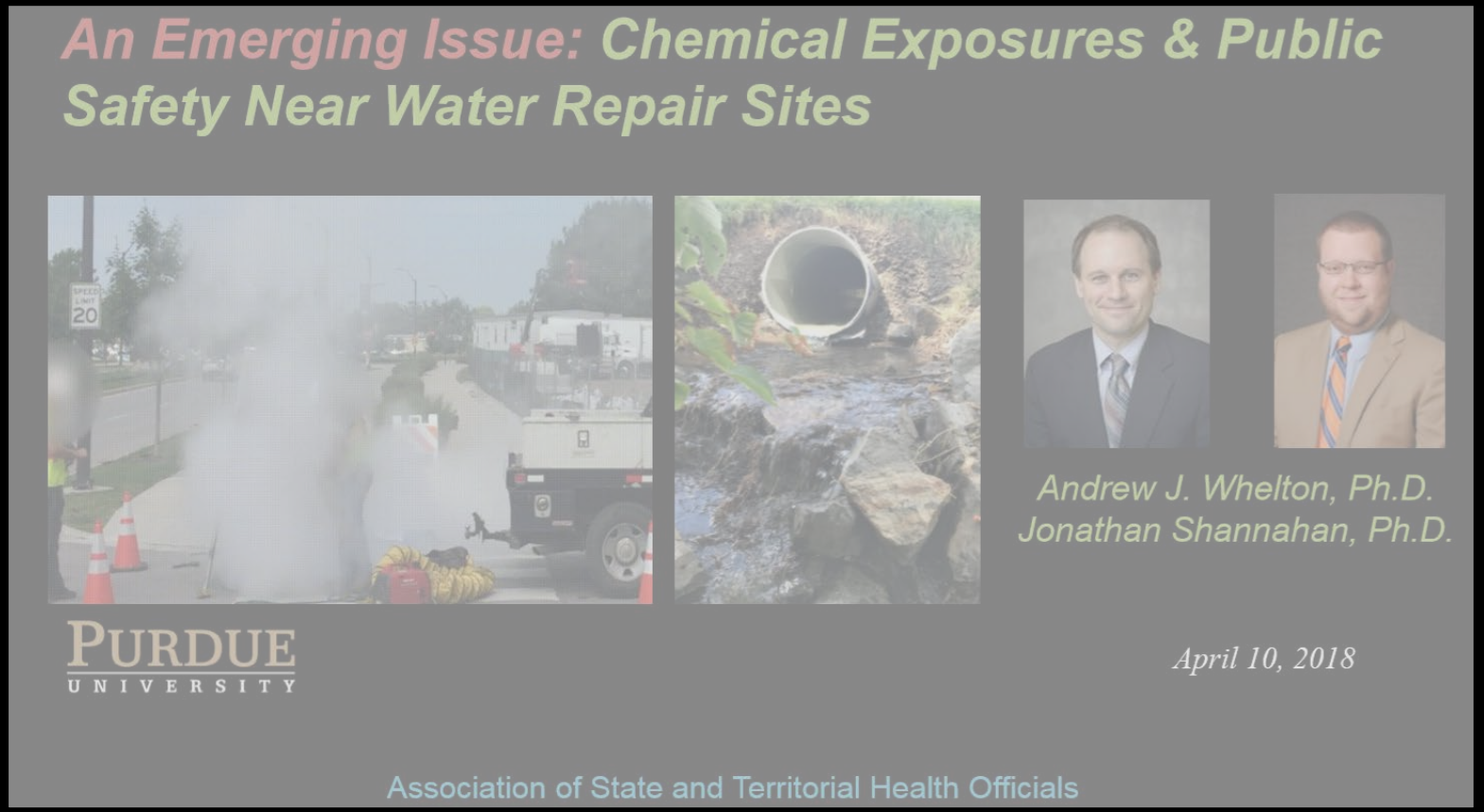
We last spoke April 2018….



Since then…

- ✓ 50+ new chem incidents
- ✓ 1 NIOSH study
- ✓ 1 worker fatality, OSHA investigation
- ✓ 1 criminal investigation
- ✓ 5 peer-reviewed testing & toxicology studies
- ✓ 1 industry study
- ✓ 1 study by 6 states

A lot has happened, but communities really need your help.

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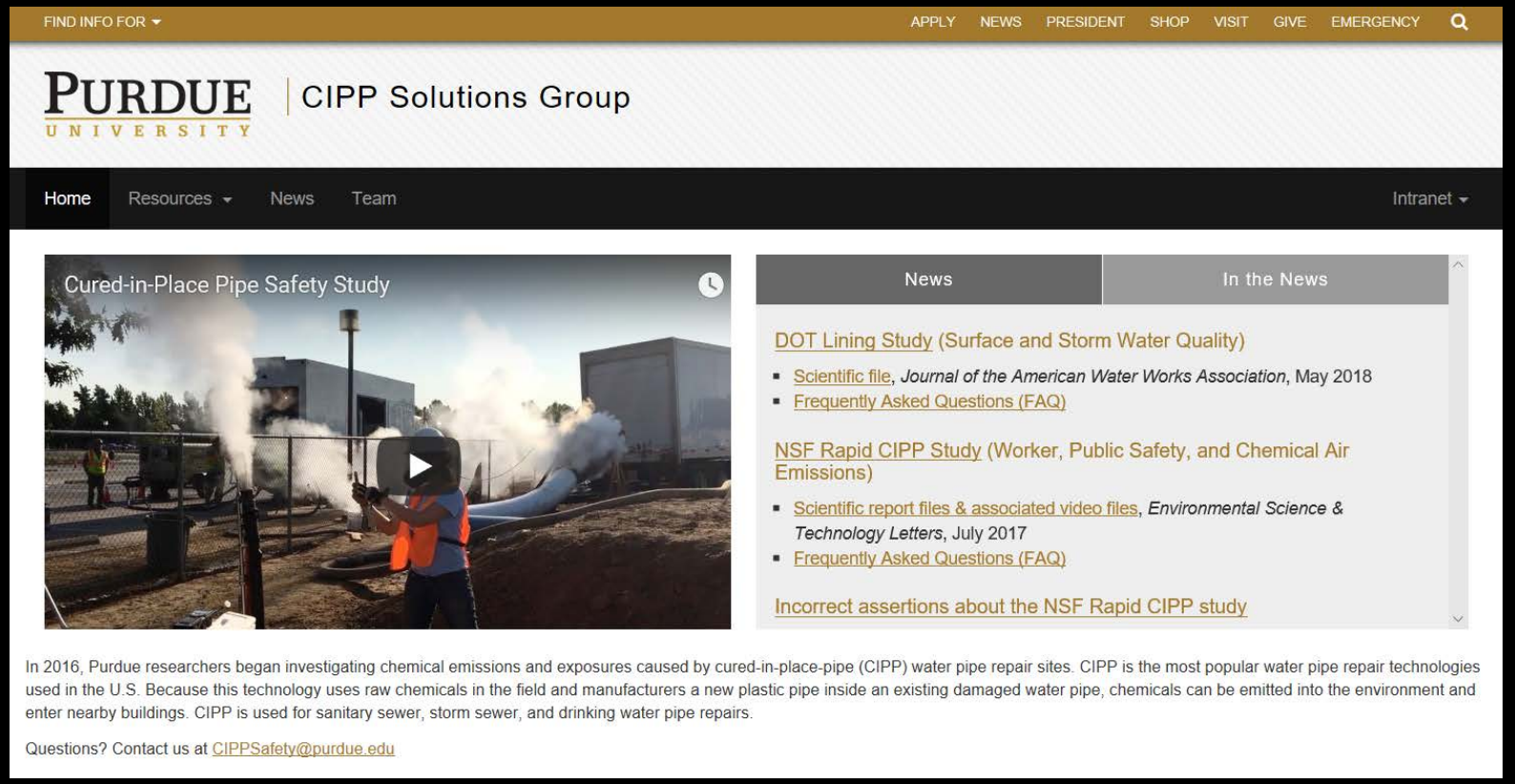
Learn More. Freely downloadable FAQs, videos, studies, & resources at *www.CIPPSafety.org*



Download free:

- 6 State Lining Report
- Recommendations
- Scientific studies
- FAQs
- Videos/webinar
- NIOSH CIPP report
- 6 State Study report
- And more...

There have been 130+ CIPP related chemical exposures in 30 States (that we know about so far)

Buildings Affected
Schools
Homes
Offices

California
Colorado
Connecticut
Florida
Georgia
Hawaii
Illinois
Indiana
Iowa
Kansas
Kentucky
Maryland
Massachusetts
Minnesota
Mississippi
Missouri
Montana
Nebraska
New Jersey
New York
North Carolina
Ohio
Oregon
Pennsylvania
Tennessee
Texas
Vermont
Virginia
Washington
Wisconsin

Since December 2019, we have been contacted about 4 new incidents in Pennsylvania and Florida

City Work Leaves a Bitter Taste For Wicker Park Bakery, Area Residents **Illinois:** Jan 16, 2020

Nathan Hale Middle School evacuated due to construction odor
Connecticut: Dec 16, 2019

Illnesses cause new policy for Seneca Falls sewer pipe repairs
New York: Oct 4, 2019

Pitcairn Propel Evacuated After Fumes Make Multiple Teachers, Students Nauseous **Pennsylvania:** Sept 24, 2019

Fumes Force Evacuation Of City Hall Friday Morning
Tennessee: Dec 14, 2018

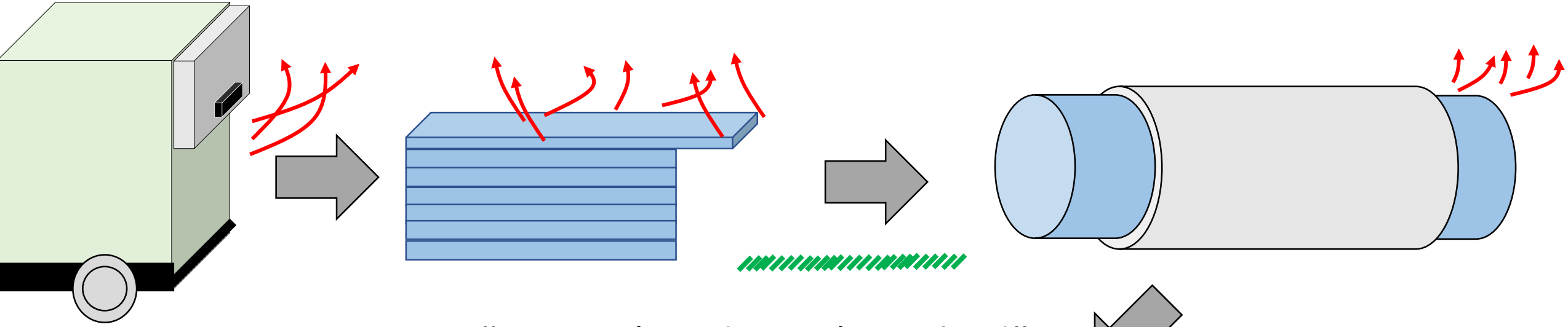
Odor from sewer work causes teachers to fall ill at Riverview Elementary School
Washington: Oct 10, 2018

Fumes Sicken 28 Pupils at Zamorano Elementary
California: Sept 21, 2017

Uncured **RESIN** tube delivered on a truck

Uncured **RESIN** tube inserted into damaged pipe (raw chemicals)

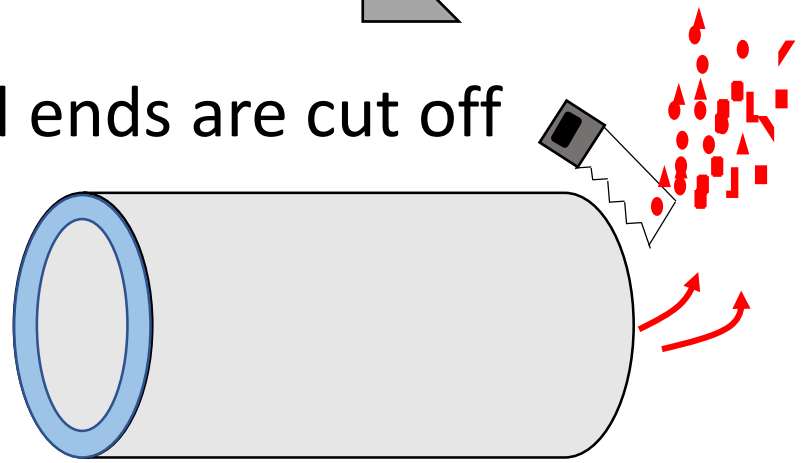
Uncured **RESIN** tube inflated with air inside host pipe



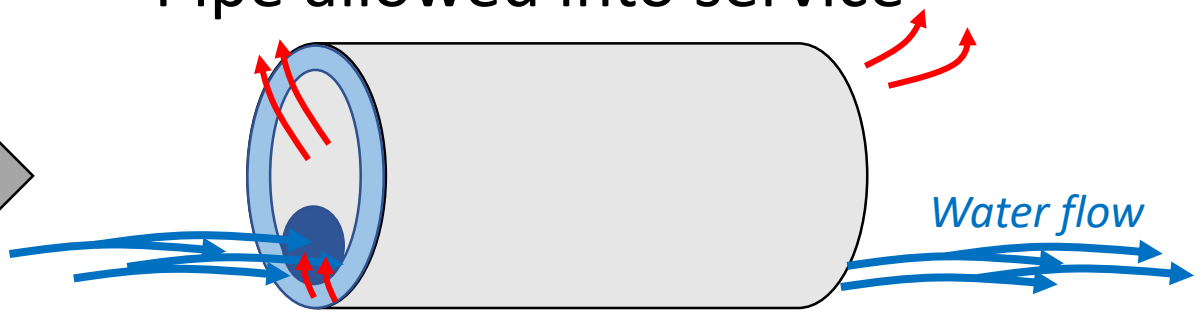
"Curing (Hardening) Method"

Hot Water or Steam or UV Light

Hard ends are cut off



Pipe allowed into service



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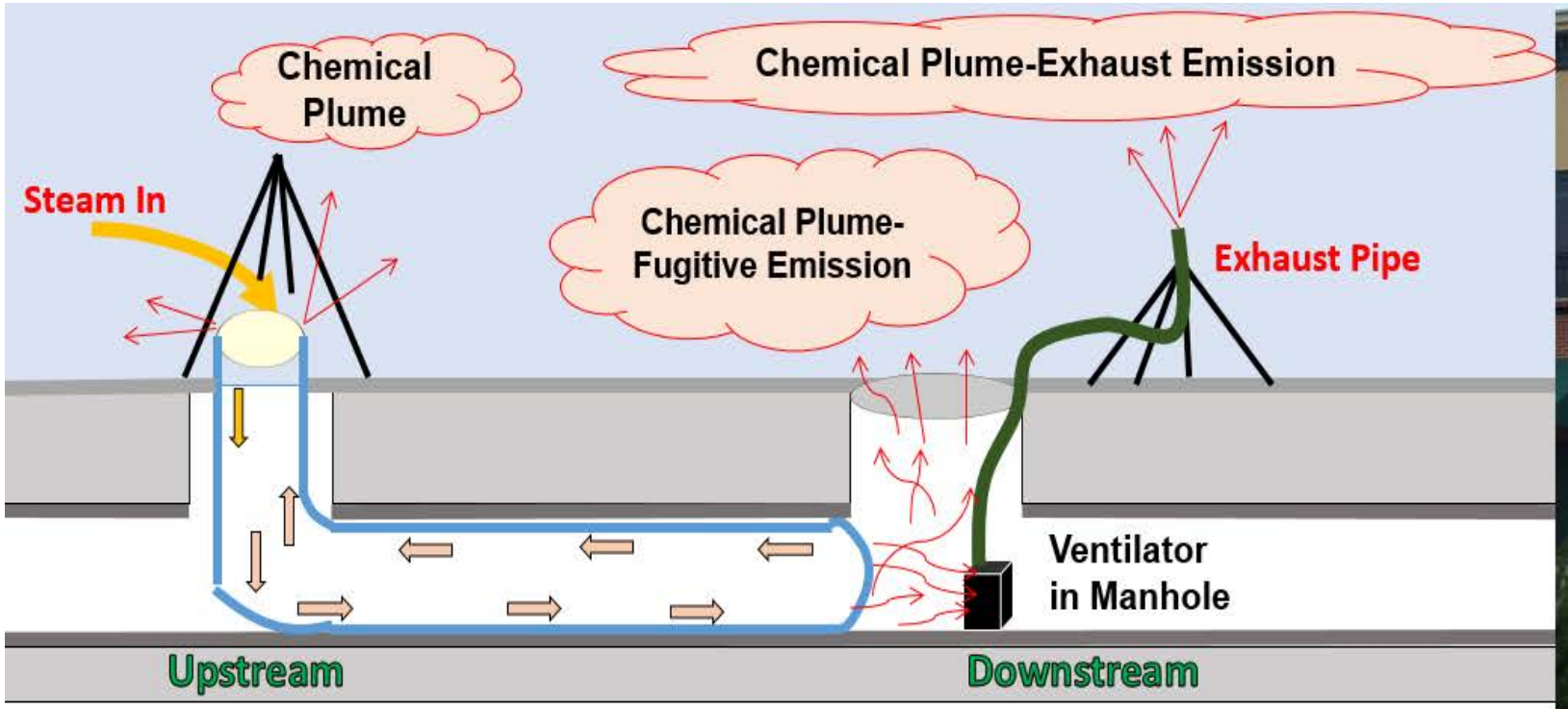
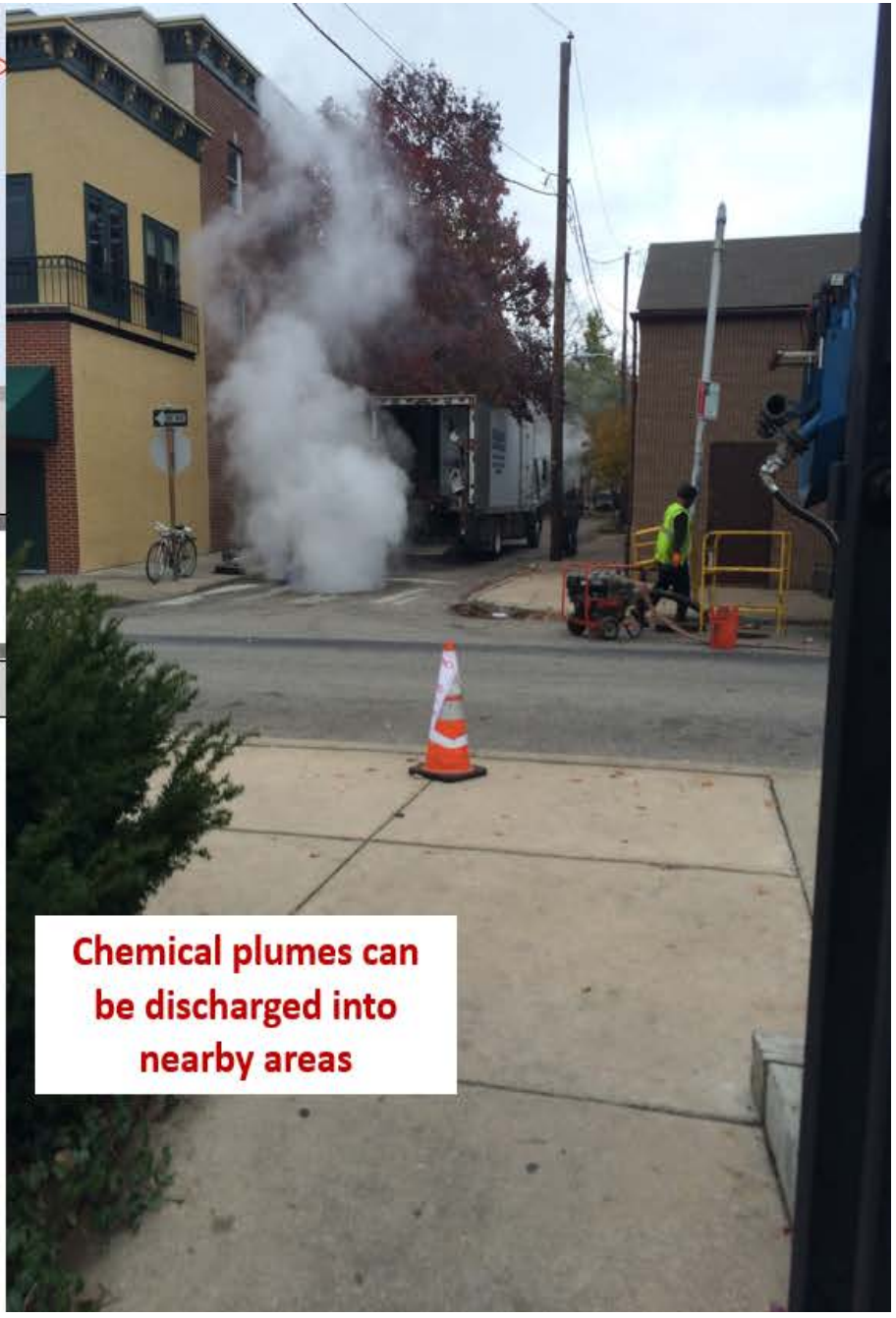
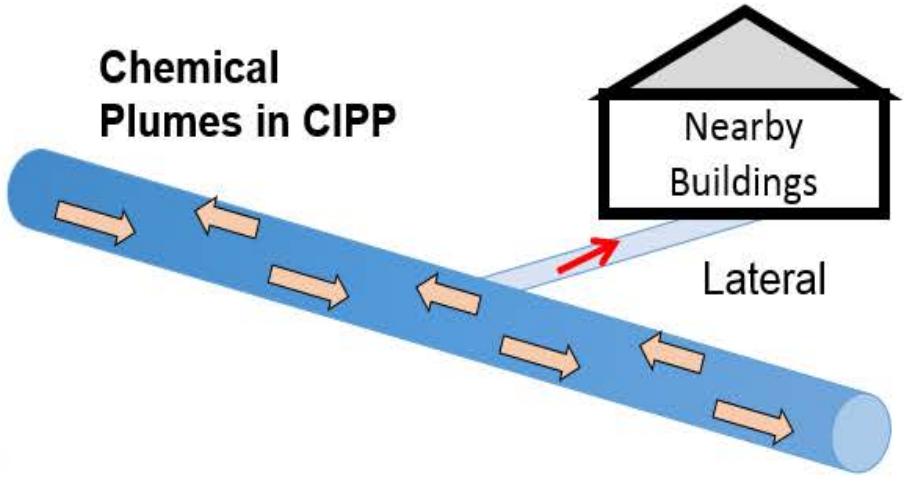




Chemical Plumes Generated by CIPP can Escape the Pipe Being Repaired



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Since 2018 we have further discovered CIPP associated chemical exposures can be serious

- Material SDSs *do not list* all chemicals of concern released including carcinogens, EDCs, and HAPs
- New chemicals are *created* during CIPP plastic manufacture
- Standard CIPP = Emissions are -*not*- captured. Instead, blown into the environment, public spaces, often buildings.
- **Most prior air testing only looked for styrene** in air
  - **1,820+ ppm** exiting CIPP liner delivery truck, St. Louis, MO
  - **250-1,070 ppm** exiting manhole in downtown Los Angeles, CA
  - **86+ ppm** & **1+ ppm methylene chloride** exiting pipes, Sacramento, CA
  - **10s-100s ppm** exiting pipes, manholes into air for several studies
- **But, *non-styrene* chemicals are released and can pose risks** [Inhalation Toxicology, Kobos et al. 2019]

If It Was Only Styrene for the General Public

CA OEHHA (2017)
Acute Ref. Exposure Level = 4.9 ppm

ATSDR (2005)
Acute Level = 2.0 ppm

Odor Threshold = 0.016 ppm

But it's not just styrene

Layer of Floating Organic Solvents

Emulsion:

- Resin
- Water
- Dissolved VOCs/SVOCs

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

Many workers have not been wearing respiratory or dermal protection.

It's NOT just styrene. Many compounds NOT listed on the SDSs have been found and have exposure limits.

Acetone
Acetophenone
Benzaldehyde
Benzene
Benzoic acid
Benzyl alcohol
BHT
2-Butanone (MEK)
tert-Butyl alcohol
tert-Butyl benzene
4-*tert*-Butylcyclohexanone
4-*tert*-Butylcyclohexanol
Chloroform
o-Chlorotoluene
Diallyl phthalate (DAP)
Dibutyl phthalate (DBP)
Diethyl phthalate (DEP)
Di(2-ethylhexyl) phthalate (DEHP)
4-(1,1-Dimethyl) cyclohexanol
4-(1,1-Dimethyl) cyclohexanone
1-Dodecanol
Ethylbenzene
3-Heptanol
Isopropylbenzene
p-Isopropyltoluene
Methylene chloride
N-Propylbenzene
Styrene
Phenol
1-Tetradecanol
Tripropylene glycol diacrylate
Toluene
1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene
Xylene (total)
And more…

Analytical Issue:

NIOSH (2019) and Purdue (2019) studies found that very high styrene level prevented our abilities to detect and quantify the other chemicals in air.

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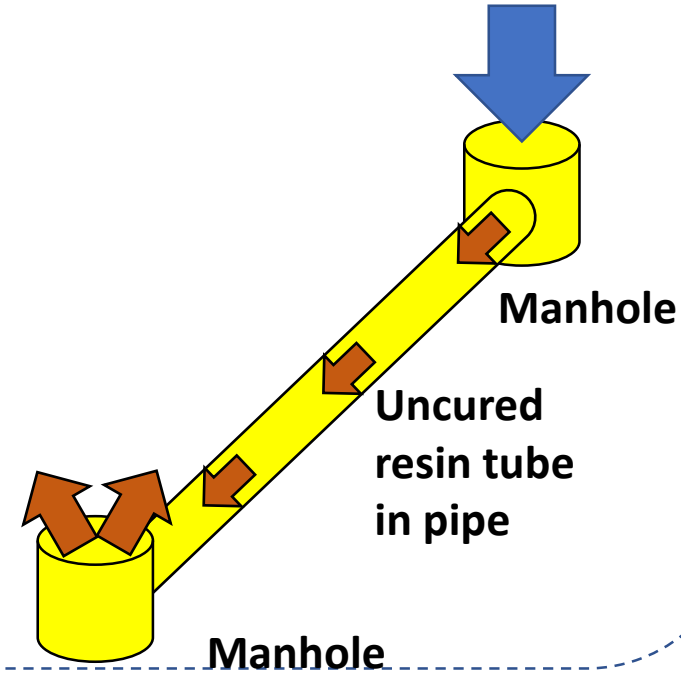
Utility/City Property
(Worksite only for contractors)

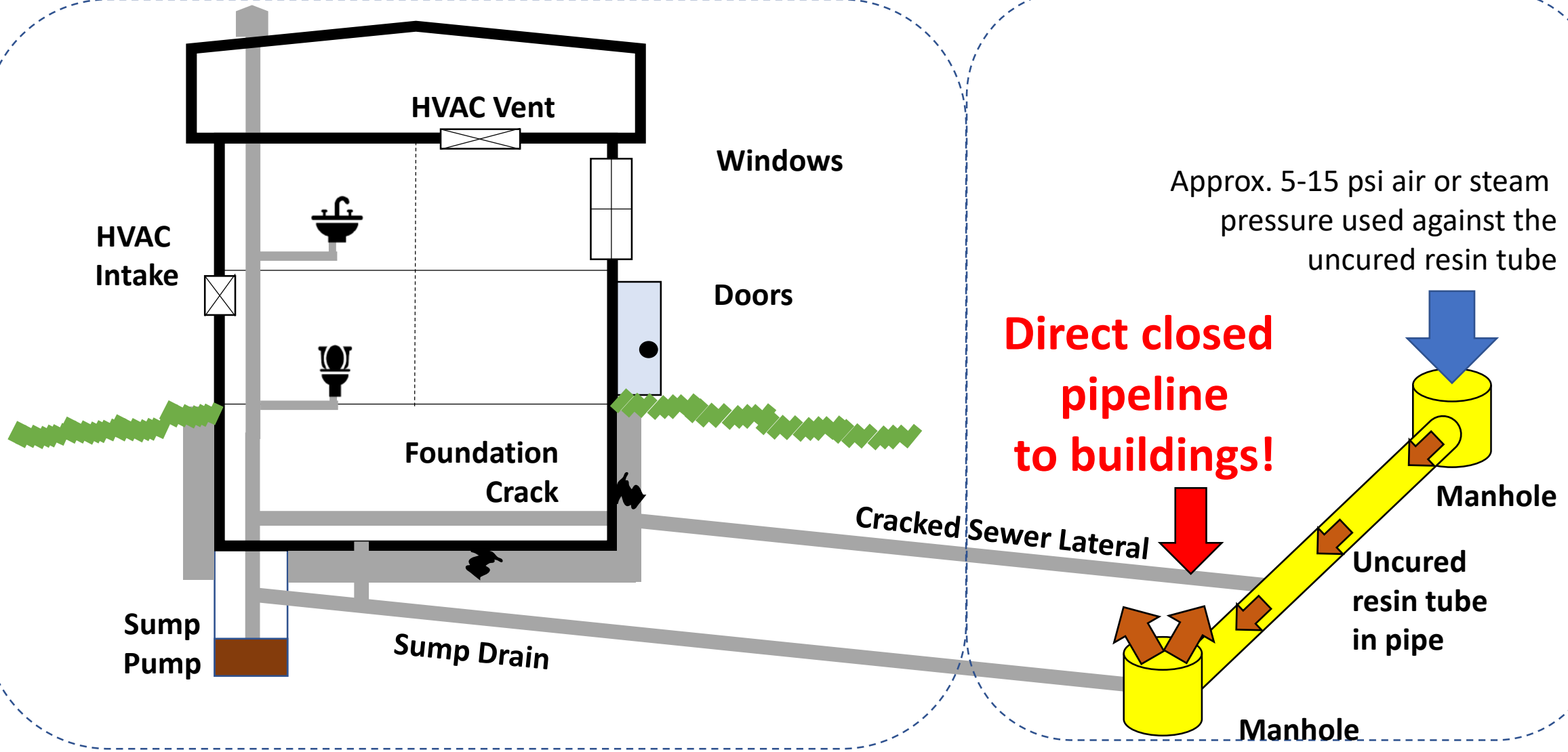
Approx. 5-15 psi air or steam pressure used against the uncured resin tube



At the street….

Private Property (NOT for contractors)

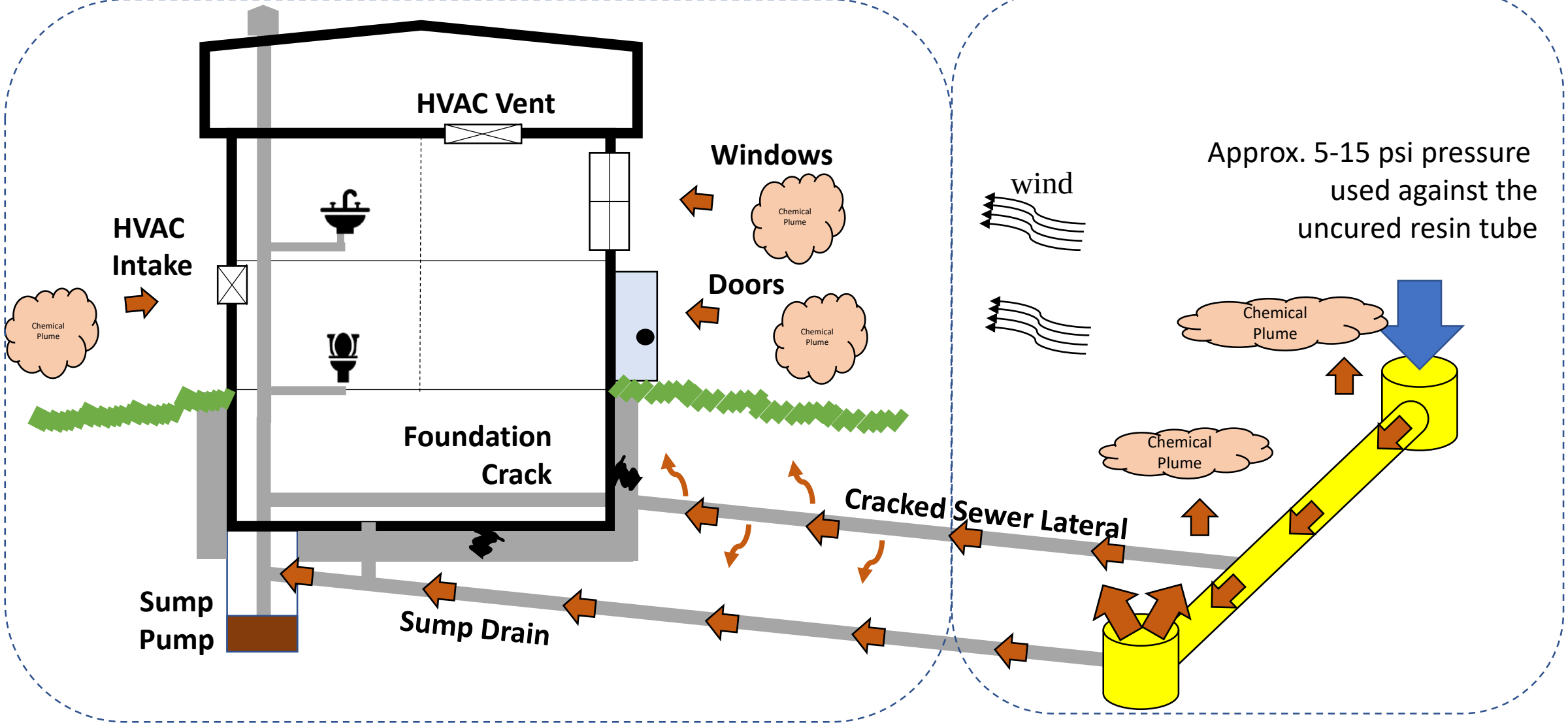
Utility/City Property (Worksite only for contractors)



While Contractors work at the street….

Private Property
(NOT for contractors)

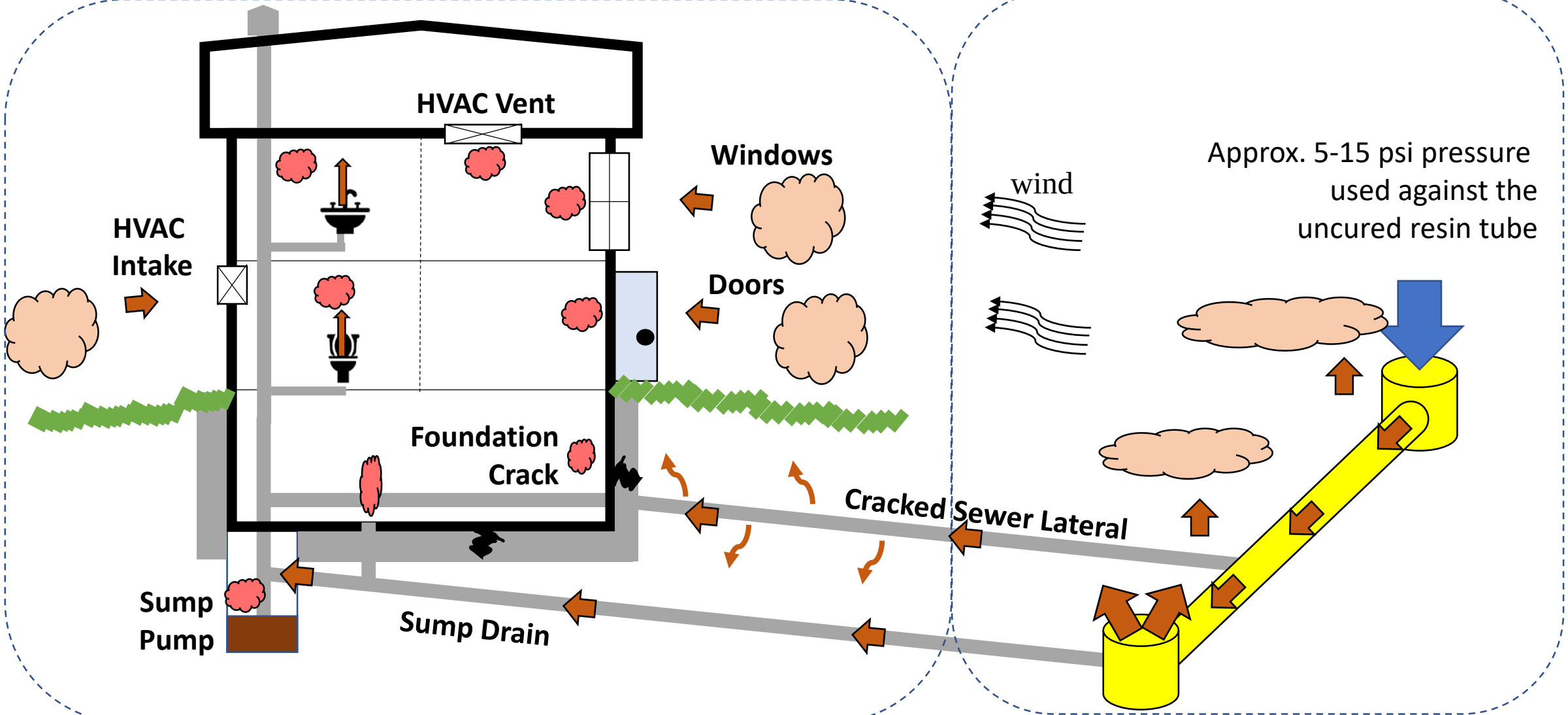
Utility/City Property
(Worksite only for contractors)



Their chemical waste leaves their worksite – above and below ground

Private Property
(NOT for contractors)

Utility/City Property
(Worksite only for contractors)



Contractors blow chemical waste into buildings and the environment

A Growing Public Health Problem in Neighborhoods Nationwide

- CIPP process waste is blown into the air, leaves worksite
- People (i.e., children, pregnant women, others) have been and can be exposed inside and outside buildings
- Waste can enter buildings by many pathways
- SDSs lack key chemical information, unreliable
- PIDs can be ineffective, 4-gas meters are ineffective
- Often
  - Exposure victims are directed to call the Construction Contractor, not health department
  - Contractors, Public Works, Engineering Firms, City Officials issue blanket safety claims for any exposure
  - Health officials are not informed, during or after incidents – victims are on their own
- Critical air testing rarely conducted
- Tip of the iceberg. Exposures happening, some very serious.

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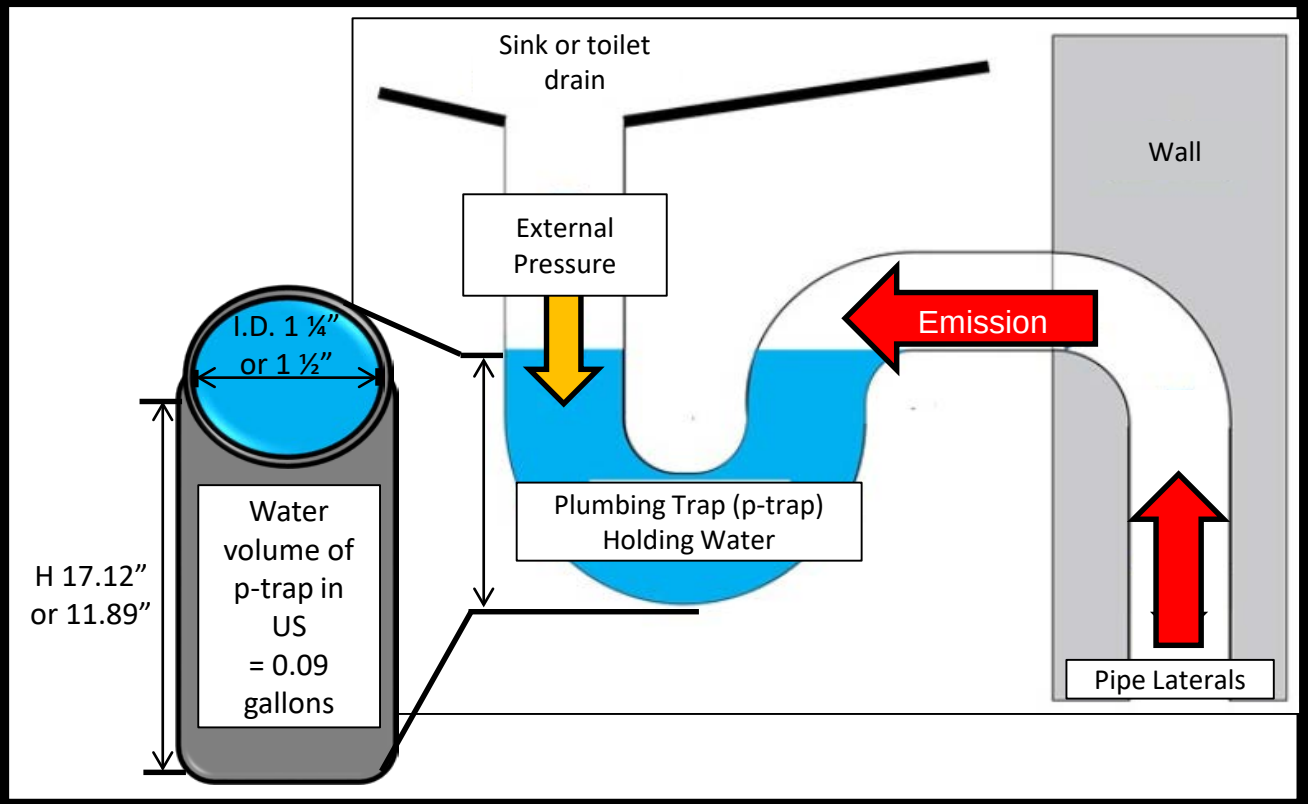
Myth: Pouring water in drains prevents exposure during CIPP manufacture. – Busted: No it does not.



Less than 1 psi pressure
can cause water blowback in an average plumbing trap (p-trap)

CIPP contractors use
5-15 psi pressure at street

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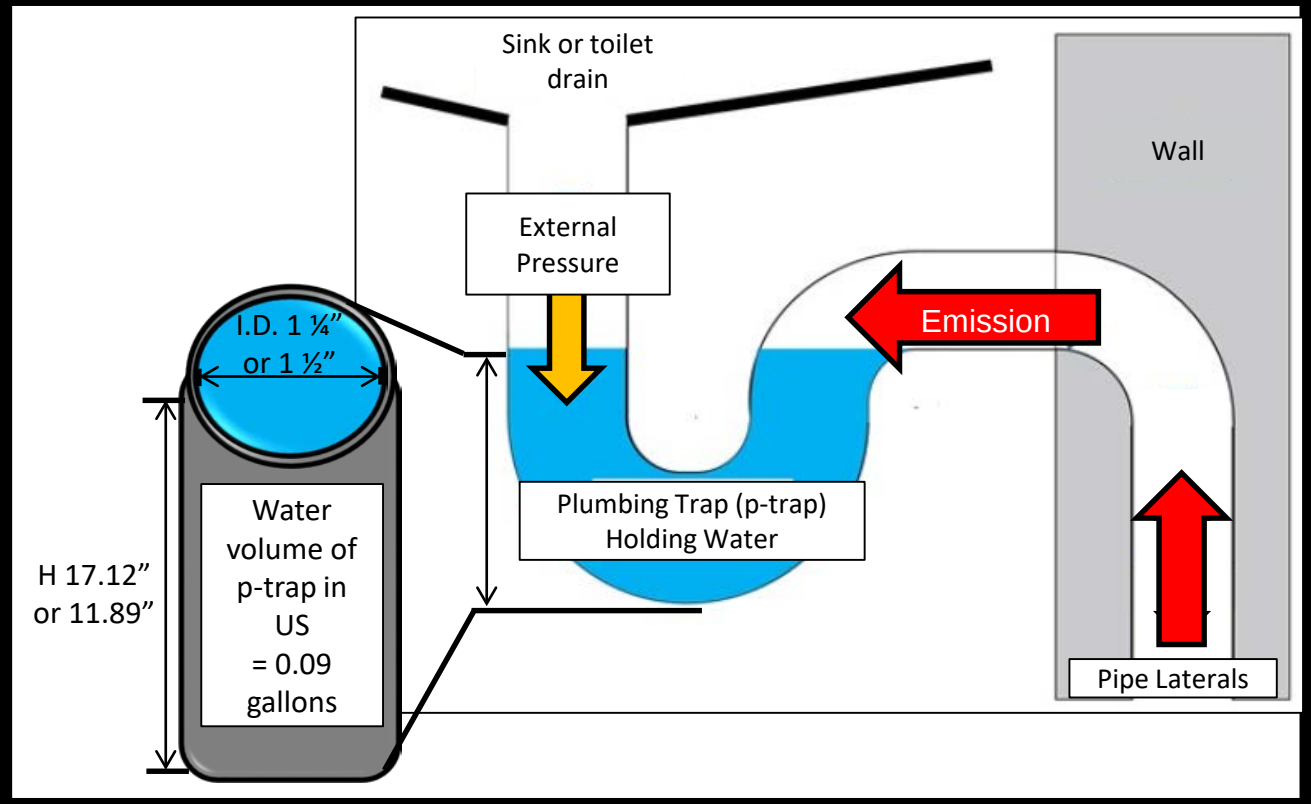
Pouring water in drains does not prevent exposure during CIPP manufacture



This implies their chemical waste *will* leave their worksite and enter private property

Less than 1 psi pressure

can cause water blowback in an average plumbing trap (p-trap)

CIPP contractors use 5-15 psi pressure at street

Contractors also may say:

1) Put a towel in the drains
2) Wrap toilet with towel
3) Wrap toilet with saran wrap

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If you find yourself responding to an incident, here's what you need to know.

1. The investigation resembles that of a chemical HAZMAT incident
2. Children, pregnant women, immunocompromised persons are, in my opinion, most at risk
3. Recommend all persons seek medical assistance onsite, hospital, or elsewhere
4. Chemical air levels can be hazardous to human health and contamination can be difficult to remove
5. Air emissions include known carcinogens, endocrine disrupting compounds, hazardous air pollutants, and many chemicals with little toxicological data. Emissions include organic vapors, liquids, particulates (partially cured resin, plastics), and water vapor.
6. Odor not 100% caused by styrene. Atmosphere is a chemical mixture. Olfactory response can be a combination of analytes present. Chemicals enter the air as a mixture.
7. 4-gas meters are not effective, unable to detect the organic vapors, particulates, liquids in air
8. Calibrated PIDs not reliable. They under- and over-estimated styrene signal by 10x to 1000x for steam-CIPP environments [NIOSH studies show PIDs readings can be off for other environments]
9. Material SDS's do not list all chemicals present of human health/exposure concern
10. New chemicals are created during CIPP installation (not listed on material SDS)
11. Public works and contractors often don't understand emissions
12. Emissions can enter buildings by multiple pathways
13. Emissions may enter neighboring buildings on the same street differently
14. Pouring water in drains does not prevent CIPP emissions from entering a building

Ideas of What's Needed

1. **We can help** State and County health departments get up to speed on what to look for, test for. We are working with multiple faculty across institutions and agencies.
2. **Raise awareness**, establish a multi-agency working group, issue notices
3. **Educate** your Public Works, Municipalities, Elected Officials about these serious exposures (they maybe permitting them, often unknowingly)
4. **Consider** air testing, but realize there are many variables.
5. **Mandate** that chemical waste emissions do not leave the CIPP being created - capture. Or, change process to not emit. Or, find another repair method.

Chemical Exposure Symptoms Reported for Persons Associated with CIPP Exposure
Headache
Nausea
Vomiting
Loss of consciousness
Eye irritation
Nostrils burning
Dizziness
Shortness of breath
Tightness of chest
Lethargy
Faint
Gagging
Confusion

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Communities need your help.
Questions?

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Learn More at www.CIPPSafety.org

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Public donations through crowd funding
Purdue University Lyles School of Civil Engineering
NIOSH-University of Illinois at Chicago Center
National Institute of Environmental Health Sciences (NIH NIEHS)
Many people at Purdue University contributed to these results and recommendations

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Extra slides

2020

Considerations for emission monitoring and liner analysis of thermally manufactured sewer cured-in-place-pipes (CIPP)

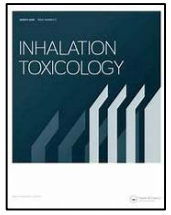
https://doi.org/10.1016/j.jhazmat.2019.02.097

Here Are Some CIPP Studies we Frequently Receive Requests For

2019

Outdoor manufacture of UV-Cured plastic linings for storm water culvert repair: Chemical emissions and residual☆

https://doi.org/10.1016/j.envpol.2018.10.080

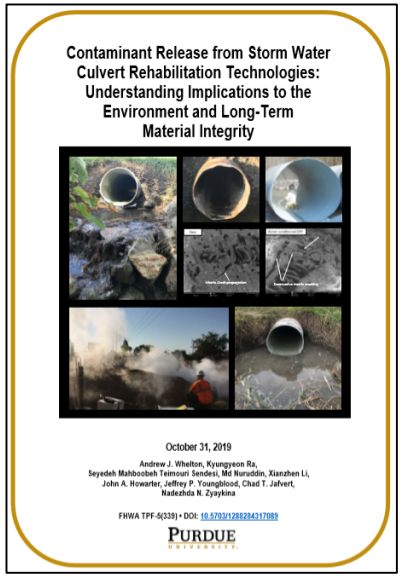


2019

***In vitro* toxicity assessment of emitted materials collected during the manufacture of water pipe plastic linings**

https://doi.org/10.1080/08958378.2019.1621966

FHWA Report, 2019



https://doi.org/10.5703/1288284317089

2019

NIOSH

Evaluation of Exposures to Styrene During Ultraviolet Cured-in-place Pipe Installation

[This is a NIOSH publication, not Purdue. Contact Dr. Ryan LeBouf, igu6@cdc.gov.]

Journal

2018

Critical Review: Surface Water and Stormwater Quality Impacts of Cured-In-Place Pipe Repairs

https://doi.org/10.1002/awwa.1042

2017

Environmental Science & Technology Letters

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

https://doi.org/10.1021/acs.estlett.7b00237

Here are a Few of the Now Debunked Safety Claims

"Styrene vapor of at most few ppm" - False
"is not a human health risk" - False
"is safe for people and animals" - False
"it is harmless steam" - False
"no hazardous conditions posed" - False
"don't be alarmed" - ?
"some people are offended by this odor and are fearful of it; even though the concentrations they smell present no harm"
– If you smell something it may in fact be harmful.


Alexandria, VA

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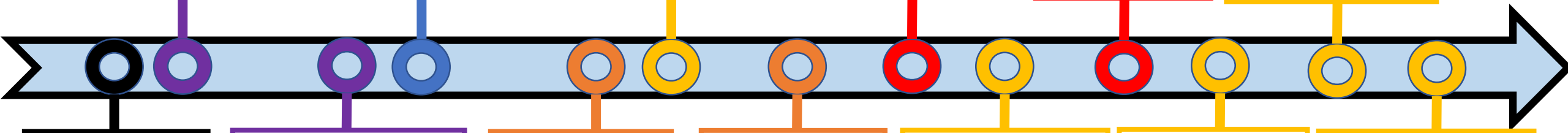

2005, The Netherlands public health agency (RIVM) finds styrene in sewer air unchanged 0.6 miles downstream

2012, Consultant: CIPP chemicals traveled "kilometers from the worksite" aboveground

2017, Worksite safety study shows white chemical plume at steam-CIPP sites is not steam, Worker and public safety upgrades needed

2017, 22-yr old CIPP worker dies on worksite, investigation finds chemical exposure a contributing factor

2019, NIOSH finds styrene exposure limit exceeded at a CIPP worksite. Advice provided.

2019, Field study shows 100+ air contamination incidents, 100+ chemicals found, Worker and public safety upgrades needed

2005, US ATSDR finds that CIPP office building contaminated caused a 'public health hazard'

2006, The Netherlands RIVM recommends all sites have air monitoring and a fan installed to expel chemicals for at least 24 h *after* CIPP installation

2017, California Department of Public Health issues 1st statewide CIPP Safety Alert

2017, California Department of Public Health issues 2nd statewide CIPP safety warning

2018, Environmental impact critical review shows a history of CIPP associated water contamination, spec upgrades needed

2018, Environmental impact field study shows CIPP water contamination, spec upgrades needed

2019, Toxicology study indicates potential for human health effects. Should consider not just styrene and long-term impacts like cancer.

More than 130 Chemical Exposure Incidents have been Associated with CIPP Manufacturing Sites in and Outside the US (some not shown)

2017 study (59)

Alexandria, Virginia
Antigo, Wisconsin
Arlington, Virginia
Baltimore, Maryland
Bellevue, Washington
Bethlehem, New York
Boston, Massachusetts
Botany Village, New Jersey
Brooklyn, New York
Cambridge, Massachusetts
Cheektowaga, New York
Clear Creek, Colorado
Des Moines, Iowa
Fayetteville, New York
Good Hope, Illinois
Helena, Montana
Kensington, Maryland
Lincoln, Nebraska
Lorain County, Ohio
Madison, Wisconsin
Milwaukee, Wisconsin
Nashville, Tennessee
North Tonawanda, New York
Philadelphia, Pennsylvania
Picayune, Mississippi
Pittsburgh, Pennsylvania
Port Huron, Michigan
Prairie Village, Kansas
Rensselaer, New York
Saint Louis, Missouri
Saint Petersburg, Florida
Saugus, Massachusetts
Snellville, Georgia
Southfield, Michigan
West Lafayette, Indiana
Willamette River, Oregon
Williams Co. Village, Ohio
Worcester, Massachusetts
Unidentified, Illinois
Unidentified, Minnesota

2019 study (45)

Andersen, Indiana
Aurora, Colorado
Austin, Texas
Alexandria, Virginia
Arlington, Virginia
Arlington, Kentucky
Barnet, Vermont
Bend, Oregon
Bolivar, Missouri
Bronxville, New York
Burlington, Kentucky
Charlotte, North Carolina
Chattanooga, Tennessee
Columbia, Missouri
Darlington, Wisconsin
Dublin, California
Effingham, Illinois
Falls Church, Virginia
Hattiesburg, Mississippi
Honolulu, Hawaii
Lees Summit, Missouri
Midland, Michigan
Milwaukee, Wisconsin
North Attleboro, Massachusetts
Nyack, New York
New York, New York
Richmond, Virginia
Salem, Virginia
Sarasota, Florida
Saint Louis Park, Minnesota
Saint Paul, Minnesota
San Diego, California
South Heights, Pennsylvania
South Pasadena, California
Tampa, Florida
Terra Haute, Indiana
Vancouver, Washington
Weymouth, Massachusetts
Whitesboro, New York

OCONUS (11)

Brisbane, AUS
Birmingham, UK
Cornwall, UK
Manchester, UK
Somerset, UK
Surrey, UK
Montréal, CAN
Ontario, CAN
Ottawa, CAN
Québec, CAN
Toronto, CAN

Known Exposures in 30 States
California, Colorado, Connecticut, Florida, Georgia, Hawaii, Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Massachusetts, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Jersey, New York, North Carolina, Ohio, Oregon, Pennsylvania, Tennessee, Texas, Vermont, Virginia, Washington, Wisconsin

2019, *Inhalation Toxicology* study: *In vitro* toxicity assessment of emitted materials collected during the manufacture of water pipe plastic linings, Kobos et al.

https://www.tandfonline.com/doi/full/10.1080/08958378.2019.1621966

Study Conclusions

- CIPP emissions likely should not be regulated based on styrene alone and exposure assessments of worksites would benefit from more comprehensive evaluation of emission components
  - Benzaldehyde, Benzoic Acid, Phenol, 1-Tetracecanol were all highest in Site 4 emissions
- Efforts should be made to adequately inform workers and the public regarding emissions as there is a potential for toxicity following inhalation exposure
- Exposures should be minimized and the proper personal protective equipment utilized
- Alterations in operational procedures should further be investigated to mitigate emissions and to understand potential adverse health effects
- Based on our findings future studies should examine cytotoxicity and cell injury, immune responses, fibrosis, and cancer as these were pathways determined to be modified significantly in representative pulmonary cells following exposure

CIPP workers, CIPP companies, Employees of city/county/state government agencies, and consulting firms can reach out to NIOSH for occupational CIPP safety advice and *–FREE–* ($0.00) onsite testing.

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.

Dr. Ryan LeBouf, CIH (igu6@cdc.gov)
Dr. Rachel Bailey (feu2@cdc.gov)

Purdue Recommendations for CIPP Construction Specs available here.

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Solvable problems exist for this innovative technology.

Emissions and exposures can present acute and chronic human health risks and environmental hazards.

August 2019 in Carlisle, PA

1 of the top 10 trout streams in the US

Fish kill (200+) associated with CIPP contractors

Styrene found, temperature not high

NOV issued to city; Criminal/law enforcement, and environmental enforcement investigations remain open

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