CUIRE Leads Research Team for Phase I of NASSCO CIPP Study

A four-month study on the review of published literature pertaining to chemical emissions of styrene-based resin used in the cured-in-place pipe (CIPP) process, found that existing studies do not adequately capture worker exposures or levels in the surrounding areas to which workers or citizens may be exposed.

The study was commissioned by the National Association of Sewer Service Companies (NASSCO) after a 2017 report suggested CIPP workers may be at risk to chemical air emissions exposure. The literature review is the first element in NASSCO's effort to obtain factual information about any risks to workers.

The study started last December and completed April 6, 2018, by researchers at UTA/CUIRE and the Institute for Underground Infrastructure (IKT) in Germany. The team determined that spatial variation of concentrations, and variations in concentrations with different meteorological conditions, are not well-determined.

Most of the steam-cure studies captured temporal variation in emissions by measuring concentrations before, during and after curing. The studies were less complete in capturing spatial variation in concentrations, measuring styrene around the termination manhole, or inside the manhole or sewer pipe itself.

Maximum values at the outlet point and inside the terminal manhole ranged from 20 to 1,070 ppm -- levels that exceed some exposure limits. However, since workers and certainly the public should not typically enter or stand directly at the termination manhole in the exhaust plume, this information is not very helpful.

At the steam-cured sites, additional field measurements of styrene concentrations surrounding the terminal manhole are needed. Only four of the steam-cure studies measured concentrations at least three feet away from the terminal manhole, versus in the manhole itself or in the exhaust plume.

On one project, employees walked the construction area periodically, but spent most of the time in their work trucks due to the cold weather. Hence, these measurements were likely not typical of worker exposures. Additional worker exposure data should be collected to capture variability in source emission rate, meteorological conditions, and the worker's location with respect to the terminal manhole.

Atmospheric concentrations of compounds are functions of the source emission rate, meteorological conditions, and the receptor location. Since concentrations are expected to vary as a function of distance from the manhole, measuring at few locations gives an incomplete picture. In addition, concentrations are expected to vary with wind speed and direction, so one day's measurements do not capture levels under differing meteorological conditions.

These earlier studies also do not adequately capture variations in emission rates from different kinds (different diameters, lengths, etc.) of pipes.

The overall results of the project at UTA/CUIRE/IKT indicated that the 21 papers reviewed have questionable methodologies and, therefore, the results presented are not conclusive. The researchers recommended additional sampling, and data evaluation and analysis, as a second phase of this study.

Update on Structural Design Methodology for Spray Applied Pipe Liners

To reduce emergency projects and impacts to the traveling public, departments of transportation (DOTs) can use spray-applied pipe linings (SAPLs) to renew deteriorated gravity stormwater conveyance conduits and culverts, provided they are discovered prior to loss of soil-structure interaction. An SAPL is a standalone application that inhibits further deterioration and can structurally renew severely damaged culvert and drainage structures. The primary materials used for SAPL generally fall into two broad categories of cementitious materials and polymers such as epoxies, and polyurethanes and polyureas.

The primary objective of this two-year study is to develop design equations for structural renewal of gravity stormwater conveyance culverts with both cementitious and polymer materials. Both circular and arch shapes with spans larger than 36 inches.
will be considered. The design equations will use loadings as detailed in the American Association of State Highway Transportation Officials’ (AASHTO’s) Load and Resistance Factor Design (LRFD) Bridge Design Specifications. Additionally, practical limitations on the use of these design equations will be included.

As part of this research, a soil box testing is planned for late summer at CUIRE laboratory at the University of Texas at Arlington. This testing program will simulate the 32-kip wheel load condition under the pavement with a shallow cover on the culvert. The SAPL thicknesses currently selected for cementitious materials are 0.5, 1.0 and 2.0 inches; for polymer materials, thicknesses are 0.25, 0.5 and 1.0 inches. So far, several vendors with cementitious, geo-polymer, and polymer SAPLs have expressed an interest to participate in this testing.

These vendors include A.W. Cook, AP/M Permaform, CentriPipe, Epoxytec, Milliken, Raven Lining Systems, Sprayroq, The Strong Company, Standard Cement and Vortex. Some have already signed up or have gone through a laboratory testing program established through the AASHTO’s National Transportation Product Evaluation Program (NTPEP) Technical Committee (TC) for SAPLs in an effort to implement this new technology. More vendors are expected to join the program. For more information on NTPEP, visit ntpep.org/Pages/SAPL.aspx.

Other aspects of this project include a national DOT survey, field data collections through site visits to actual SAPL installations, considerations for impact of corrugations and additional reinforcement, development of performance specifications, and computational modeling through finite element analysis. The project is scheduled to be completed in December 2019.

To participate in this unique project, DOTs and vendors can contact Jeffrey Syar, P.E., administrator, Ohio DOT Office of Hydraulic Engineering at (614) 275-1373 or Jeffrey.Syar@dot.ohio.gov; or Dr. Mo Najaf, principal investigator for this project, at (817) 272-9177 or najafi@uta.edu.

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**CUIRE To Hold 17th Annual Pipeline, Trenchless Engineering & Inspector Schools**

The Center for Underground Infrastructure Research & Education (CUIRE) will hold its 17th annual Pipeline and Trenchless Technology Engineering/Inspector training and certification schools on Monday and Tuesday, Jan 28-29, 2019, at the Fort Worth Convention Center in Fort Worth, Texas. The schools will be held in conjunction with the Underground Construction Technology International Conference & Exhibition (UCT). Attendees may register for any of the following half-day schools and receive a full conference pass to UCT, as well.

**Monday, Jan 28, 8 a.m. – noon**
- Advanced Horizontal Directional Drilling (HDD) School (Part One)
- Geotechnical School (Part One)
- Pipe School (Part One)

**Monday, Jan 28, 1 – 5 p.m.**
- Advanced HDD School (Part Two)
- Geotechnical School (Part Two)
- Pipe School (Part Two)

**Tuesday, Jan 29, 8 a.m. – noon**
- Mud School
- Microtunneling and Pilot Tube School
- Pipe Lining and Renewal School

For more information, contact CUIRE at (817) 272-9177, cuire@uta.edu or by visiting www.cuire.org.
CUIRE to Develop Design, Installation Guides for Pipe-in Liner Product

CUIRE is a research, education and outreach organization and part of the University of Texas at Arlington’s (UTA) Department of Civil Engineering. Since its inception in 2002, CUIRE has focused on assembling exceptional and broad-reaching engineering and technical talent to address the needs of underground infrastructure on a regional, state, national and international scale.

Through a research contract with Asoe Hose Manufacturing Inc., China, for its Pipe-in Liner product, CUIRE will develop a complete design guide with equations and sample calculations, and an installation guide that includes pre-planning, planning, installation, delivery, and closeout and safety precautions. Both these documents will be prepared for the U.S. market. Pipe-in Liner is a fabric-reinforced, flexible plastic pipe (FRFPP), as shown above.

The Asoe's Pipe-in Liner product is a trenchless method using lining with inserted hoses to renew water, gas and oil pipelines, and are classified into four different series:

- Pipe-in Liner W series to rehabilitate water main pipes and other types of water pressure pipes at normal temperature
- Pipe-in Liner O series to rehabilitate oil pipes onshore or offshore
- Pipe-in Liner G series to rehabilitate gas pipes onshore or offshore
- Pipe-in Liner H series to rehabilitate pipes in municipal hot water systems. The H series can resist temperatures up to 203 degrees F. Asoe is the first in the world to develop this type of solution to renew hot water pipes.

The Pipe-in Liner can be used to install a liner where pressure rating is greater than that of the host pipe, and where the host pipe is in structurally sound condition but has localized corrosion perforations and/or leaking joints. The new pipe must be reduced in diameter as a separate operation prior to installation into the host pipe. Long, continuous lengths can then be inserted in a single operation. Depending on site conditions, section lengths up to 13,000 feet can be inserted in a single pull. This method is available over a range of diameters, from 5 to 40 inches.

Asoe manufactures different hoses, including through-the-weave polyurethane (PU) lay-flat hoses and fire hoses. Jacketed fire hoses are lined with ethylene propylene diene monomer (EPDM), polyurethane (PU), nitrile butadiene rubber (NBR), PVC and natural rubber (NR). Asoe designs and manufactures hose couplings, which work with its hoses, according to different technical requirements in different applications. The materials applied in couplings are aluminum, carbon steel, stainless steel and PE.

For more information, contact Asoe at sales@asoehose.com, (281) 971-8693 or asoehose.com.

Obituary – Jim C. Scott

Jim C. Scott, 85, passed away October 8, 2017, after an extended illness. Jim was a board member of CUIRE at UTA for many years and supported educational, outreach and research activities at the Center.

He was a pioneer in the trenchless technology industry, working for Affholder Tunnelling and then Insuitform Mid-America and Insuitform Technologies. Jim was a people person, working in sales and marketing, and was known for his direct approach and tireless work efforts. His larger-than-life personality and ability to build relationships with others were recognized among his colleagues and friends.

Jim leaves his wife Betty, five children and nine grandchildren. He will be missed by all at CUIRE and the industry as a whole.

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