

Spray Applied Epoxy

the perfect trenchless solution for
Baltimore's box culvert

PRESENTED BY
Danny Warren



WARREN
ENVIRONMENTAL

Check us out in this month's issue of the



NORTHEAST JOURNAL
OF TRENCHLESS TECHNOLOGY PRACTICES

ALONG THE OCEAN 17 FEET BELOW GRADE

***Town of Wareham MA Uses Trenchless Epoxy CIPP
to Repair 8-inch Asbestos Cement Gravity Main***



Lining & curing pipe into the night. The neighbors could not have been more hospitable





Confined Space Coating Success

Over
40
Years
Experience

Boston State House, 1971

40 Years of Doing Things Right The First Time



- **ENR.com**, “Robinson reservoir receives cutting edge upgrade” ~2013
- **Construction Equipment Guide**, “Husband, Wife team find solutions to unusual problems in tough spaces” ~ 2012
- **NACE International**, “Zero (VOC) Structural Epoxy Rehabilitation of Steel and Concrete Tanks, Pipes and Structures” ~ 2003
- **American Water Works Association (AWWA)**, “Creating a feasible five-year inspection and capital improvement plan for a 26-mile aqueduct in Northern Utah” ~2012
- **NASSCO Times**, “Meet a member” ~ 2013
- **Journal of Protective Coatings and Linings (JPCL)**, “Corrosion-Laden Clarifier Restored” ~2002
- **JPCL**, “Innovative Practice, New Equipment Development to spray 100% solids epoxy coating” ~ 1993

REPRINTED FROM

Trenchless TECHNOLOGY™

I N T E R N A T I O N A L

JANUARY 2008
TRENCHLESSONLINE.COM

Warren Environmental Inc.

**A Small Company Makes a Big
Footprint in the Coatings World**

(Une Petite Compagnie Fait Une Grande
Impression Dans Le Monde Des Revêtements)



Also inside:

Getting to Know New ISTT
Chairman Det Downey (pg. 46)

2007 Student and Academic
Award Winners — Rome No-Dig (pg. 50)

CIPP & GRP Lining
Work in Romania (pg. 52)

ISTT Update (pg. 56)

81 S.SHORE ROAD
02554

DPW OFFICE (508) 228-7244
WASTEWATER MAIN LINE (508) 325-5333
CHIEF OPERATOR DIRECT (508) 228-4824
EMAIL: dgray@nantucket-ma.gov

TOWN OF NANTUCKET MASSACHUSETTS
SURFSIDE WASTEWATER TREATMENT FACILITY



DEPARTMENT OF PUBLIC WORKS
WASTEWATER OPERATIONS

05/12/2015

RE: Warren Environmental Inc.

A&W Maintenance

Project Surfside Wastewater Facility Headworks Lining and Demo Manhole.

As Chief Operator I am pleased to write this letter praising the services of Warren Environmental and A&W Maintenance. Our headworks structure was suffering from extreme corrosion and concrete degradation from high levels of H2S. We had an estimate of 8.8 Million Dollars to build a new structure and demolition of existing structure. I went to the industry and the internet to find a less costly option. I found numerous vendors that did provide lining and coating services. I reached out to 3 companies that made the long and often difficult trip out to the Island. After meetings and extended research I did but out an RFP for services. A&W did win the bid for what I considered a very reasonable rate for the project they faced. Our structure was originally built in 1981 and faced numerous upgrades. In our 2007 facility upgrade the entire facility had covers installed on all tanks and process basins this is when our problems started.

Danny and his team were very professional and courteous to our special needs at our Facility on an island located directly on the ocean. The project went extremely well was completed sooner than expected and well within the proposed budget. We are extremely happy with the finished projects and will be doing much more business in the future as we proceed with lining all our manholes some up to 100 years old.

This option of a structural epoxy lining has saved the Town of Nantucket years of permitting planning and construction and saved us financially approx. 8.63 million dollars allowing me to pursue other critical projects.

Please feel free to contact me at anytime

Chief Operator David C Gray Sr



8,630,000 Reasons

to consider

Warren Environmental

“This option of a structural epoxy lining has saved the Town of Nantucket years of permitting planning and construction and saved us financially approx. 8.63 million dollars allowing me to pursue other critical projects.”

JANINE L. BURKE
EXECUTIVE DIRECTOR

MATHEW J. SOLITRO
COLLECTION SYSTEM MANAGER



SCOTT AVEDISIAN
MAYOR

Aaron Guckian
CHAIRMAN

WARWICK SEWER AUTHORITY
125 Arthur W. Devine Boulevard
WARWICK, RHODE ISLAND 02886
TEL (401) 739-4949 • FAX (401) 739-1414

3/16/15

RE: Cedar Swamp Manhole Rehabilitation

**800,000 Gallons per day stopped
(292 Million gallons per year)**

To Whom It May Concern:

Approximately five years ago, A & W Maintenance rehabilitated one of our most severely deteriorated pump stations, the Cedar Swamp pump station, using Warren Environmental 151 Injection Grout and Warren Environmental S301-14 100 % solids epoxy spray system.

Before the pump station was rehabilitated, we were processing an additional 800,000 gallons of water a day at the treatment plant due to infiltration into that structure. The water was continuously monitored both before and after the repair. The Warren system successfully controlled the infiltration problem.

Today, five years later, the infiltration is still completely stopped.

The repair was completed efficiently and in short order by a very professional crew. We are very pleased with the success of the repair and would highly recommend the Warren system for any difficult water and sewer repairs.

Thank you,

Mathew J. Solitro
Collection System Manager
Warwick Sewer Authority

Still Stopped 5 years later!

1.46 Billion gallons stopped so far

UMASS Dartmouth Saves \$500,000 Annually





NO SOLVENT PLEASE

**Only use resins that have been tested to
ASTM E84-98A & BSS 7239-88
(Never use a product containing solvents)**

OSHA INSTRUCTION

U.S. DEPARTMENT OF LABOR Occupational Safety and Health Administration

DIRECTIVE NUMBER: CPL 03-00-017 EFFECTIVE DATE: June 20, 2013

SUBJECT: National Emphasis Program – Occupational Exposure to Isocyanates

ABSTRACT

Purpose: This instruction describes policies and procedures for implementing a National Emphasis Program to identify and reduce or eliminate the incidence of adverse health effects associated with occupational exposure to isocyanates.

Scope: This instruction applies OSHA-wide.

References: OSHA Instruction CPL 02-00-150, Field Operations Manual (FOM), April 22, 2011; OSHA Notice 13-01 (CPL 02), Site-Specific Targeting 2012 (SST-12), January 4, 2013.

Cancellations: This instruction supersedes all Regional and Local Emphasis Programs specifically dealing with isocyanates.

State Impact: Notice of intent and adoption required. See Section VII.

Action Offices: OSHA National, Regional and Area Offices, State Plan and State Consultation
Originating Office: Office of Health Enforcement

Offices.



NIOSH ALERT

Preventing Asthma and Death from MDI Exposure During Spray-on Truck Bed Liner and Related Applications



DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health



DANGER



POISON



90 Billion Dollar Whistleblower Suit

Paint and Coatings Industry News

Chemical Giants Face \$90B Suit

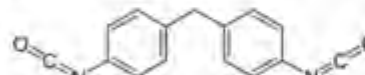
Wednesday, September 21, 2016

More Items for Coating Materials

Store items from Asia Pacific: EMEA (Europe, Middle East and Africa), Latin America, North America

Four major chemical manufacturers are facing a \$90 billion lawsuit in which a group of U.S. law firms claim they concealed information about dangers of isocyanate paint for decades.

In the suit, "Kalsen, Barmco, Tarnco & Prochem LLP claims that for years, chemical giants BASF, Covestro (formerly Bayer MaterialScience), The Dow Chemical Company and Huntsman Corporation withheld information about the toxicity of the isocyanate chemicals from the U.S. Environmental Protection Agency.



The suit was filed under seal in the Northern District of California and was recently unsealed according to reports.

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Qui Tam Complaint

The lawsuit claims that the suit on behalf of itself and the U.S. government is a qui tam suit. It is a qui tam suit, a type of lawsuit that allows a private citizen to sue on behalf of the government. The suit is a qui tam suit, a type of lawsuit that allows a private citizen to sue on behalf of the government.

"The suit deals with chemicals including methylene diphenyl diisocyanate (MDI), used in making polyurethanes."

"For years, chemical giants BASF, Covestro (formerly Bayer MaterialScience), The Dow Chemical Company and Huntsman Corporation withheld information about the toxicity of the isocyanate chemicals..."

"From 1979 through 2003, the companies worked both alone and in concert to suppress evidence that such small amounts of the chemicals could cause respiratory damage. Nondisclosure of the information, the suit says, constitutes a breach of both the Toxic Substances Control Act and the False Claims Act."

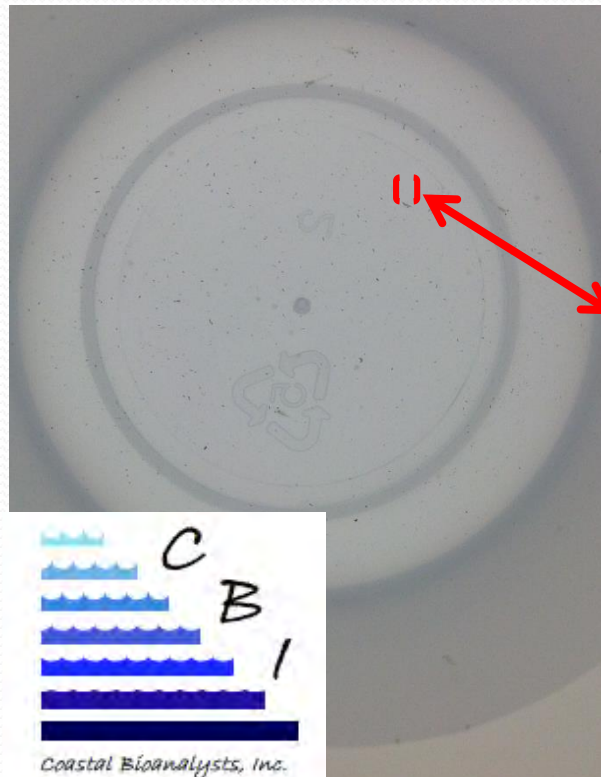
Acute Marine Toxicity

Preformed by Coastal Bioanalysts Inc.



“There was **100% survival** in 100% elutriate and all dilutions for both products. Photos of the live animals at test end attached.” -Peter F. De Lisle, Ph.D

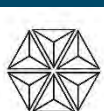
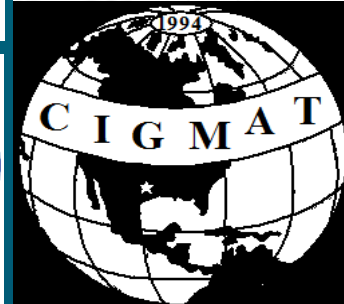
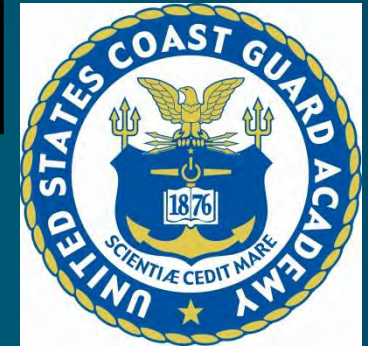
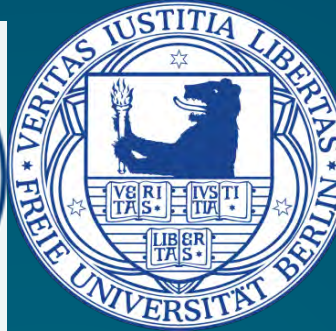
- Highly sensitive shrimp-like crustaceans were exposed to Warren Environmental's potable water epoxies.
- After 48 hours 100% of the creatures were alive and in good health
- Passing this test is extremely uncommon in large scale rehabilitation products



Warren Environmental Training Center Middleborough , MA.



Extensive 3rd Party Testing



Bristol-Myers Squibb



"108% Increase in failure load"



(a)



(b)

Figure 2- Three-Edge-Bearing Test Setup per ASTM C497 (a) and Strain Gauge Installation.

Range: 45% - 133% Increase

Discussion of Results

The test results indicate that the epoxy lining material used by Warren Company has significantly increased the structural capabilities of the concrete samples. While the range of increase in failure loads was 45 to 133 percent, in this case, the concrete pipe's failure load **was increased by 108%** as a result of being lined by epoxy material. Figure 3 shows the final test results. Also as a result of lining, the pipes became stiffer than the concrete pipes which resulted in lower values of deflection and strain in compression and tension zones comparing to the bare pipe.

Type and Sample Code	Liner Thickness (mils)	Average Peak Load (lb.)	Peak Strain in Compression [(in/in)x 10 ⁻⁶]	Peak Strain in Tension [(in/in)x 10 ⁻⁶]	Peak Stress in Compression (psi)	Peak Stress in Tension (psi)	Maximum Deflection (in.)	% Difference Load	Failure Mode
Bare Pipe									
Bare Pipe	N/A	13,826	-250	105	1,250	525	0.0621	N/A	N/A ¹ (Figure No. 4)
Epoxy									
Epoxy 2	180	28,746	-204	76	170	65	0.0193	+(108)	Crack in Lining ² (Figure No. 5)

Severe Wastewater Analysis Test



RAE Engineering and Inspection Ltd.

13 May 2016

Warren Environmental Inc
P.O. Box 1206, Carver, Ma. 02330, USA

Attention: Jane Warren

Reference: SWAT test of Warren Environmental coating

To whom it may concern,

In 2010, RAE Engineering and Inspection Ltd. (RAE Engineering) was requested to perform a laboratory SWAT (Severe Waste Water Accelerated Test) exposure for Warren Environmental coating.

The SWAT conditions were: cyclic dipping (3 dips per day) into 10% sulphuric acid with 4000 ppm NaCl, a gas atmosphere of air with 500 ppm H₂S and a test temperature of 65°C. Originally, the test duration selected was 28 days; however the SWAT duration was extended to 145 days as requested.

At the conclusion of the test exposure, the two panels labeled with Warren Environmental Panel #011 and Panel #012 were evaluated by blistering analysis, adhesion analysis, foam analysis, color change, Dry Film Thickness (DFT) and Electrochemical Impedance Spectroscopy (EIS) analysis. The Warren Environmental coating showed the best performance compared to other coatings tested in the same batch, having small blisters and excellent impedance.

“Dipping (3 dips per day) into 10% sulphuric acid with 4000 ppm NaCl a gas atmosphere with 500 ppm H₂S and a test temperature of 65c. The SWAT duration was extended to 145 days”

“The Warren Environmental coating showed the best performance compared to other coatings tested in the same batch having small blisters and excellent impedance”



Massachusetts Culvert Inspection





University of Pittsburgh

*Swanson School of Engineering
Department of Civil and Environmental Engineering*

742 Benedum Hall
3700 O'Hara Street
Pittsburgh, PA 15261
412-624-9870
412-624-0135 (fax)

18 November, 2013

Warren Environmental Inc.
P.O. Box 1206
Carver, MA 02330

RE : Warren Environmental epoxy system-service life

To Whom It May Concern:

I am an Associate Professor of Structural Engineering and Mechanics at the University of Pittsburgh. I am an internationally recognized expert on repairs bonded to concrete and steel substrates, having co-authored the accepted state of the art review on the latter. In my previous position at the University of South Carolina, I served as Principal Investigator on three projects testing the structural properties of the Warren Environmental epoxy system. More recently, I conducted a large test program investigating aspects of bond and performance of the Warren Environmental epoxy system used as an intimately-bonded lining system for deteriorated large diameter concrete pipe.

Based on my knowledge of the Warren system, it is my opinion that the intimately-bonded epoxy lining obtained using this product has a service life exceeding 75 years when applied to welded steel or concrete having in service conditions typical for processed domestic waste water (non-caustic materials and little sediment/abrasives to cause erosion). In such an application, ensuring sound bond of the epoxy to the steel substrate is of critical importance. The Warren-specified preparation of a steel substrate to "SP10 white metal blast with a minimum surface profile of 1-1.5 mils", or in the case of concrete, "acid etching followed by high pressure water blasting at 4,000-5,000 psi" is, in my opinion, adequate to ensure the necessary bond properties particularly given the spray method of application used for this product.

Sincerely,

Kent A. Harries, Ph.D., F.ACI, P.Eng.
Associate Professor, Structural Engineering and Mechanics
Editor, *Journal of Construction and Building Materials* (Elsevier)
Associate Editor, *ASCE Journal of Bridge Engineering*

**“Service life
exceeding
75 years in
Active sewer
conditions”**

Victor Valley Adhesion Test

ASTM D 7234-05

- Cored & glued dolly pull-off test
- Spec called for 80psi. for 1 min
- The Warren Environmental system achieved adhesion ranging from **500 - 1,100psi.**
- All pulls resulted in test glue failure



NY Aqueduct





16 year Inspection New York Aqueduct, May 12th 2010 on Warren Epoxy. Inspection performed by Parsons Brinckerhoff, New York Office. The Single Coat, 40 mil application was in PERFECT CONDITION after 16 years of constant flow.

Adhesion in 100% Humidity on Wet Surfaces



Challenges on Baltimore Project



Presence of industrial product contamination in substrate / ground water made the surface extremely difficult for most products to adhere too



Presence of a >14 month old failed “renovation system” Throughout the project, that the installer/Manufacturer failed to remove, repair or replace despite a 30 year “warranty”

Solution: 100% Solids Epoxy



- Tenacious bond to wet surfaces
- Monolithic barrier stops contaminants
- Safe for environment and local stakeholders
- Safest option
- Quickest option



“Warren Environmental / A&W Maintenance Valuable Contributors to
Safety, Security, Environment, Health And Exceptional Performance”
- 2015 - **ExxonMobil**

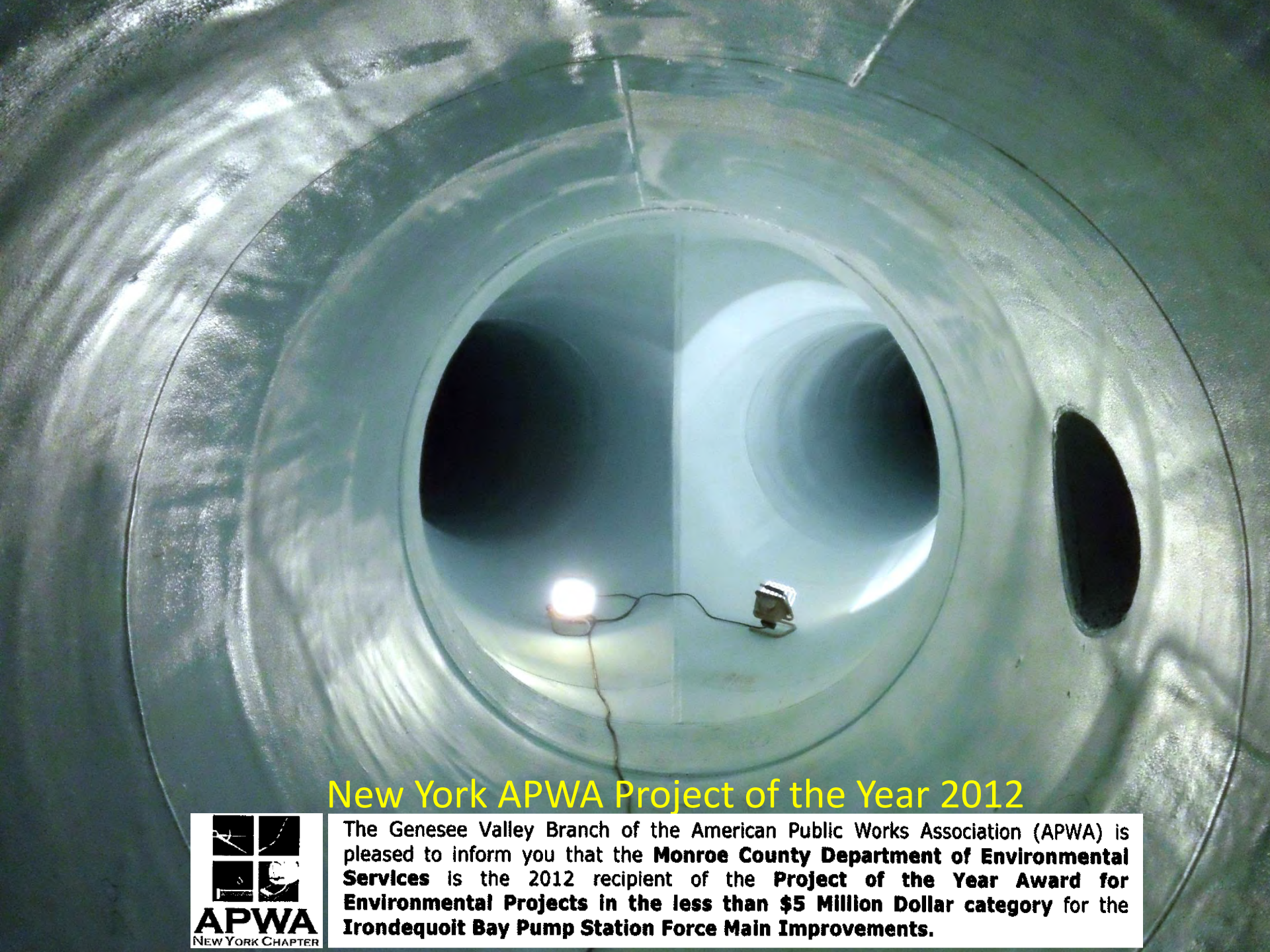


Before

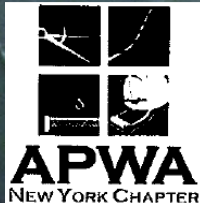


After





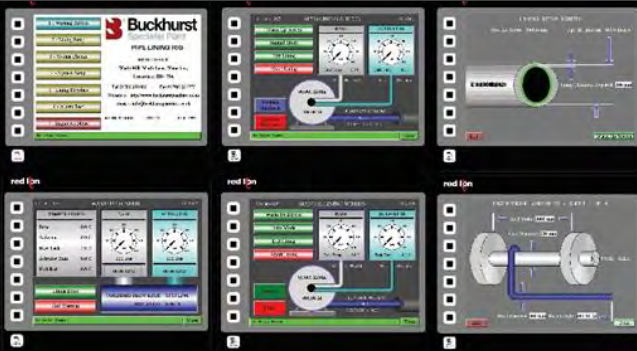
New York APWA Project of the Year 2012



The Genesee Valley Branch of the American Public Works Association (APWA) is pleased to inform you that the **Monroe County Department of Environmental Services** is the 2012 recipient of the **Project of the Year Award for Environmental Projects** in the **less than \$5 Million Dollar** category for the **Irondequoit Bay Pump Station Force Main Improvements**.

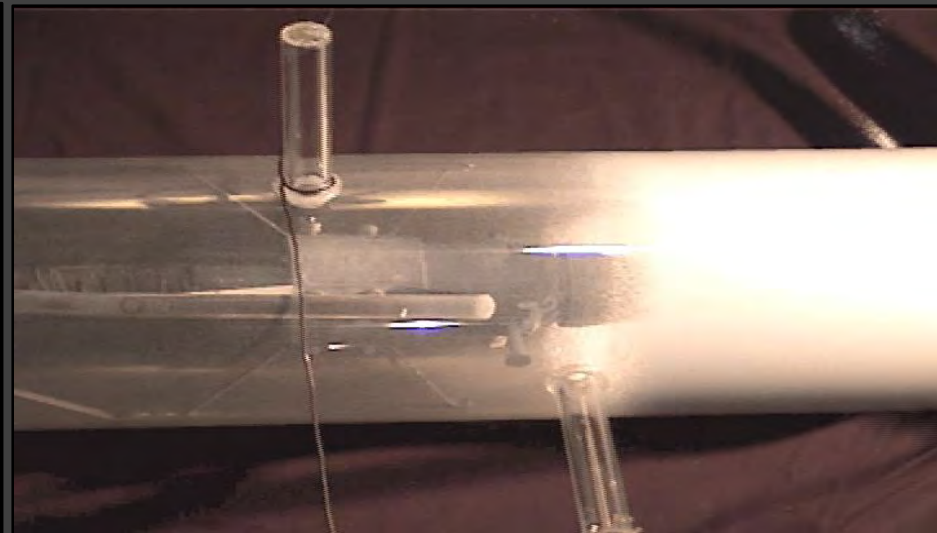
Spin-Cast Lining

- Fully Automated Seamless Lining
- 4"- 70" Pipe
- Does Not Block Laterals



100% Solids Epoxy
Pipe Spin System

warrenenviro.com



Tasmania Flume



Sonora Pass





Warren Environmental, Inc.

solvent free, corrosion resistant 100% solids structural epoxy systems



NASTT'S 2014 NO-DIG SHOW
THE MAGIC OF TRENCHLESS

**NASTT'S
INNOVATIVE
PRODUCT
AWARD
WINNER**



*Christina M. Neutz, P.E., SME
Geotechnical Engineer
Levee Safety Subject Matter
Expert*

Questions?