



**NORTH AMERICAN SOCIETY FOR TRENCHLESS TECHNOLOGY**

# **A SUMMARY OF THE DIVERSE MANHOLE REHABILITATION SPECIFICATIONS AND PRODUCTS THAT EXIST IN THE MARKET PLACE (A CONTRACTORS POINT OF VIEW)**

**Dennis Sullivan, P.E. National Water Main Cleaning (NWMCC) A Carylton  
Company, Canton MA**

**James Fleming, National Water Main Cleaning (NWMCC) A Carylton  
Company, Canton MA**



**NASTT'S NORTHEAST CHAPTER  
TECHNICAL SESSION NOV 2019**

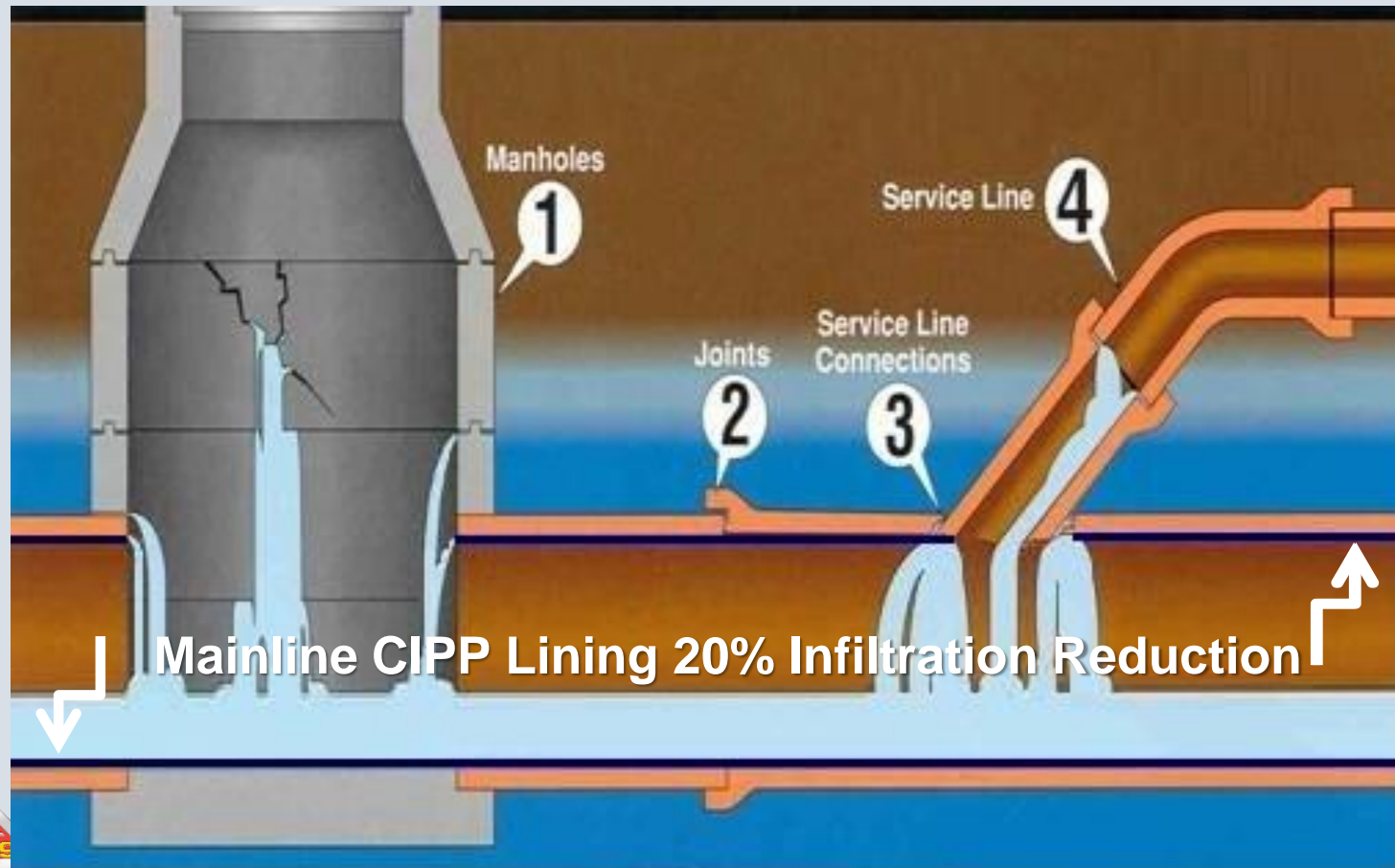


# Reasons to Rehabilitate Manholes in a Sanitary Collection System and How It Influences the Design

1. **85% Infiltration Reduction (MH Rehabilitation is a component of a Comprehensive Infiltration Reduction Approach)**
2. **5% Extend the Life Expectancy of the Manhole Structure**
3. **5% Address Hydrogen Sulfide Corrosion Causing Manhole Failure**
4. **5% Prevent Soil Loss Causing Potholing and Pavement Failure**

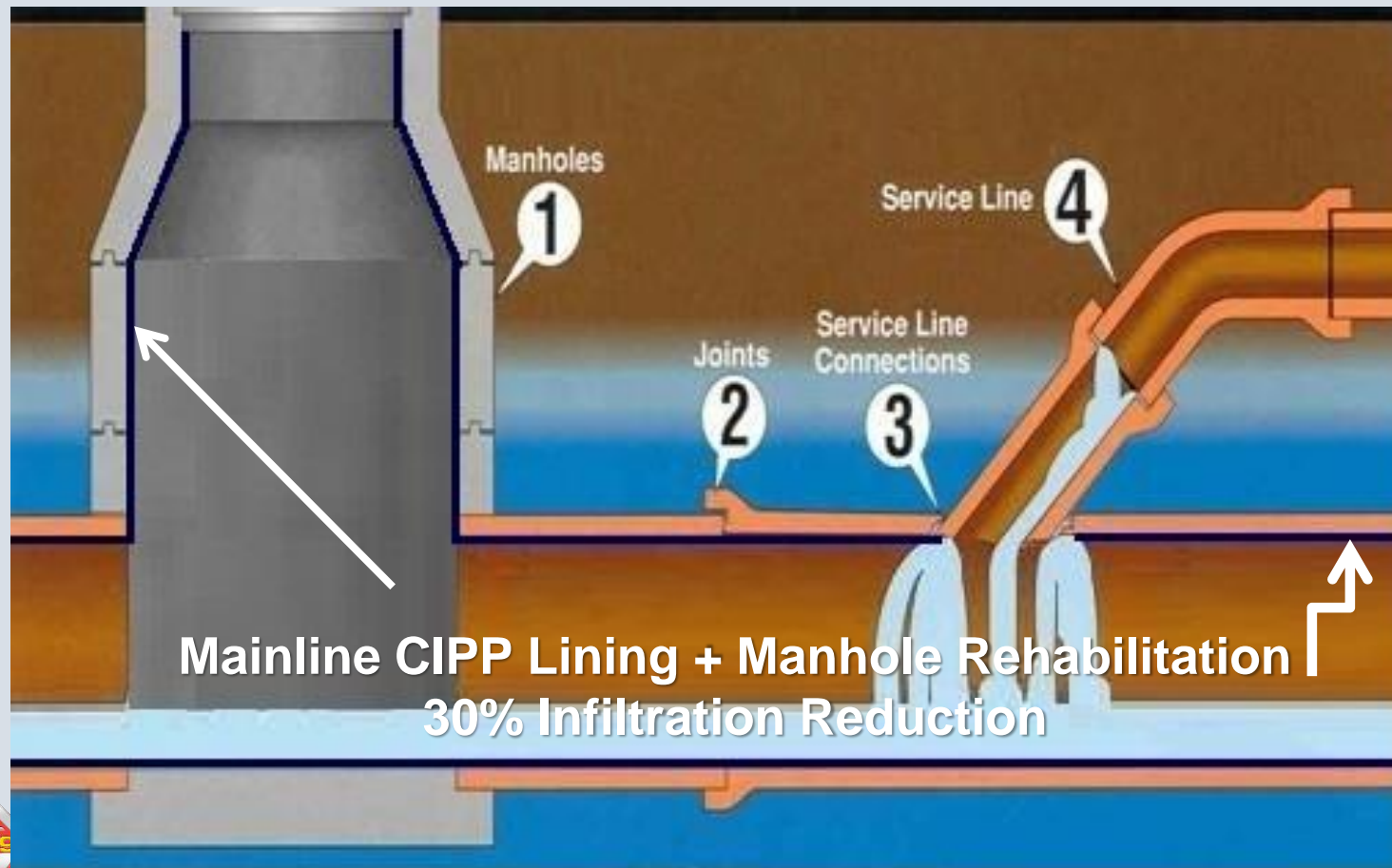


# Trenchless Rehabilitation for Infiltration Removal: FOLLOW THE STEPS

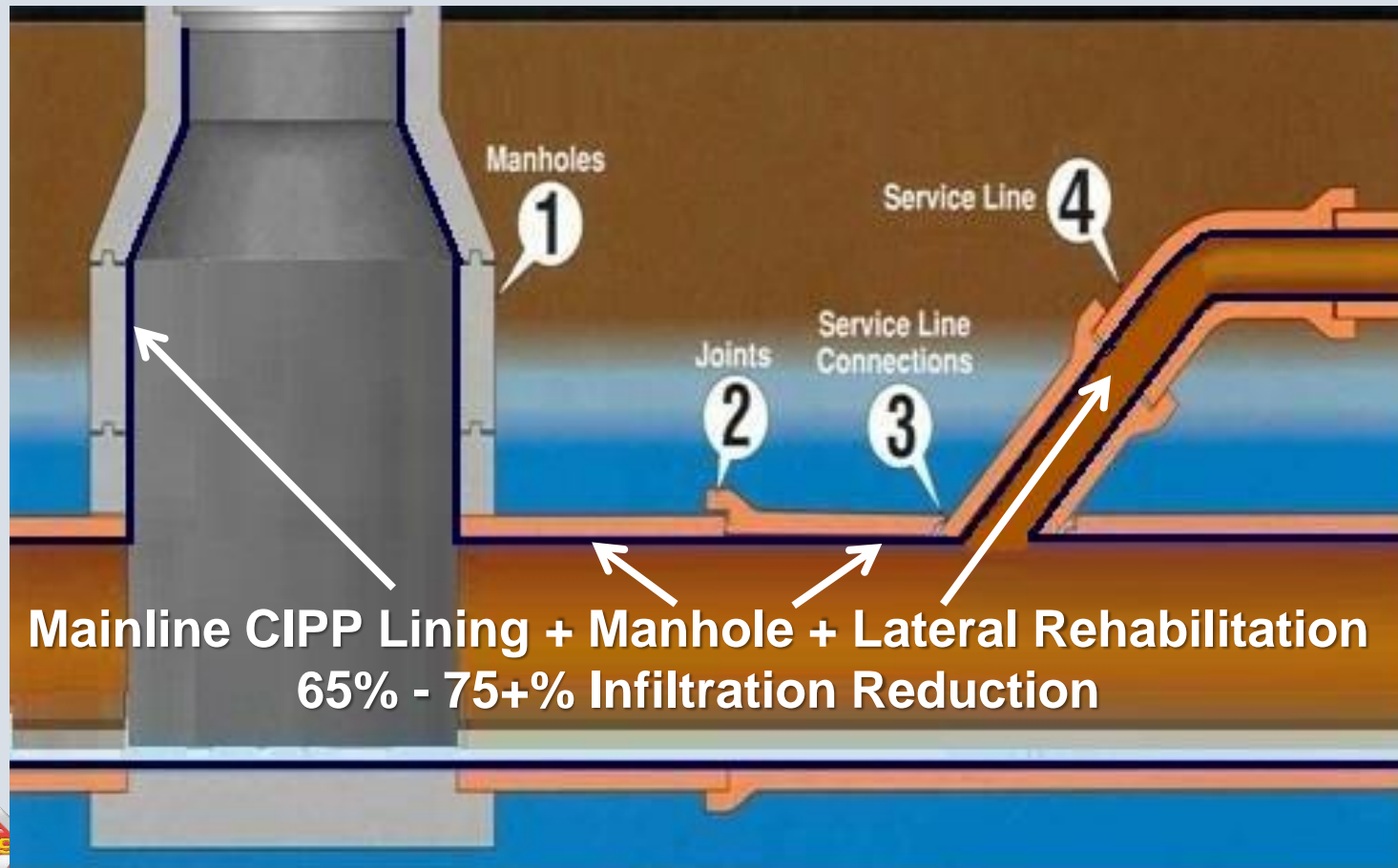




# Trenchless Rehabilitation for Infiltration Removal: FOLLOW THE STEPS



**Trenchless Rehabilitation for Infiltration Removal:  
FOLLOW THE STEPS**



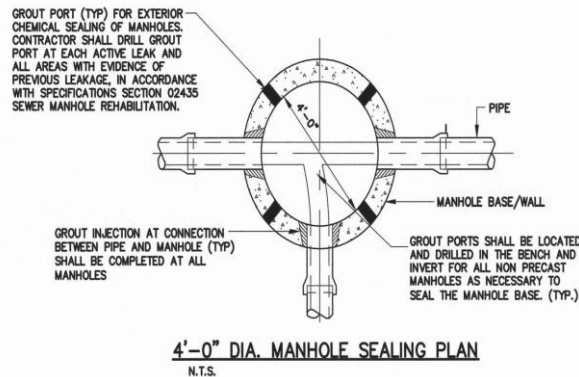
# #1\_GROUTING AND PATCH DESIGN

- COMMONLY CALLED OUT FOR PRECAST STRUCTURES WITH INFILTRATION ISSUES
- CHEMICAL GROUTS USED TO SEAL LEAKS FROM THE EXTERIOR OF THE MANHOLE & FAST SETTING HYDRAULIC CEMENT MATERIALS TO PATCH VOIDS/HOLES



## Pros:

- Low Cost



## Cons:

- Low Life Expectancy
- Making hole in existing structure (Could be making it worse for the future)
- No Hydrogen Sulfide Resistance



# CHEMICAL GROUTS ACRILIMIDE / HYDROPHILIC / HYDROPHOBIC

- PRIME RESINS – PR-10 ACLM, AR 800, PRIME FLEX
- QUADDEX – I&I GUARD
- PARSONS – SEAL TITE, HYDRO GROUT, PERMASEAL
- MADEWELL – MAINSTAY MLCA
- AVANTI – AV100, AV-118, AV202, AV248





# #2\_PORTLAND BASED CEMENT DESIGN

- STRUCTURAL REPAIR AND INFILTRATION ELIMINATION - FOR LOW CORROSIVE ENVIRONMENTS – 8k-10k psi



## Pros:

- Low Cost
- Structural Repair and Infiltration Elimination

## Cons:

- Not resistant to Hydrogen Sulfide as other products





# PORTLAND CEMENT

- QUADDEX – QM1S
- STRONG SEAL – MS2A
- CEMTEC –MSM
- SAUEREISEN – F121
- PARSONS – MH LINER
- MADEWELL – MAINSTAY ML72
- AP/M PERMAFORM – MS 10,000
- IPA SYSTEMS – IPATOP RM
- RAVEN LINING SYSTEMS – RAVEN 755
- STANDARD CEMENT – RELINER MSP



# #3\_CALCIIUM ALUMINATE DESIGN

- INTENDED FOR MODERATE H<sub>2</sub>S CORROSIVE ENVIRONMENTS OR LARGE DIAMETER SYSTEMS
- SETS AND CURES QUICKLY - PRODUCT MAY FLASH SET DURING MIXING & SPRAYING OPERATION – SENSITIVE TO HEAT AND LOW MOISTURE STRUCTURES
- PRODUCT IS CEMENT BASED AND GOES THROUGH A HYDRATION PROCESS TO CURE



## Pros:

- Better resistance to Hydrogen sulfide than Portland Based



## Cons:

- Higher Material Price than Portland Based Product
- More difficult to use in hotter temperatures
- Susceptible to cracking due to quicker hydration process



# CALCIUM ALUMINATE CEMENT

- QUADDEX – ALUMALINER
- STRONG SEAL – MS2C
- CEMTEC –CAM
- SAUEREISEN – F170
- PARSONS – CA LINER
- MADEWELL – MAINSTAY MLCA
- RAVEN LINING SYSTEMS – RAVEN 705 CA
- STANDARD CEMENT – MAXIMUM CA PLUS
- KERNEOS – SEWPERCOAT (100% PURE CALCIUM)





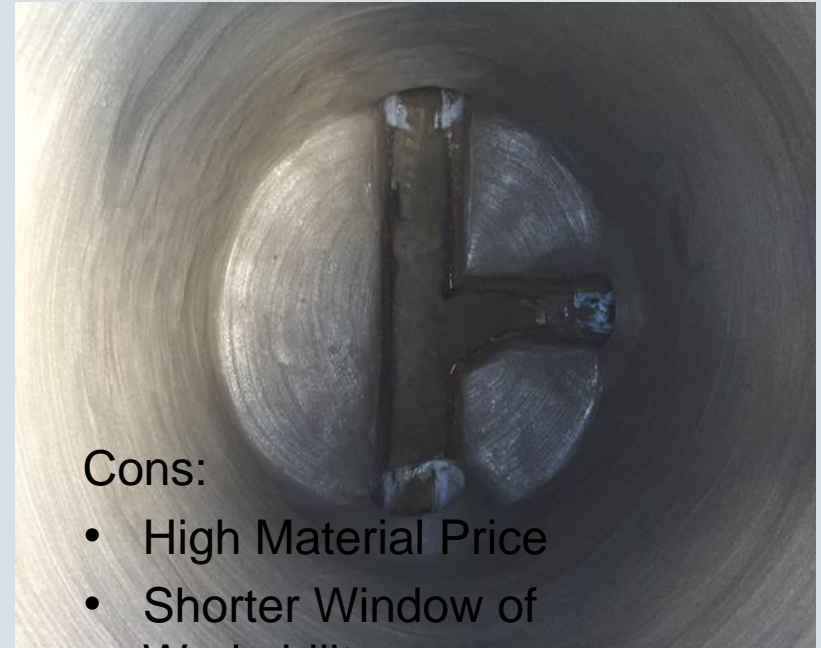
# #4\_GEOPOLYMER DESIGN

- STRUCTURAL REPAIR, INFILTRATION ELIMINATION & CORROSION PROTECTION IN HIGH H<sub>2</sub>S ENVIRONMENTS – 8k-10k psi
- SETS AND CURES QUICKLY - PRODUCT MAY FLASH SET DURING MIXING & SPRAYING OPERATION – HARD WITHIN 3-4 HOURS!!!
- PRODUCT IS A GEOPOLYMER AND GOES THROUGH A CHEMICAL REACTION PROCESS TO CURE



## Pros:

- Higher Resistance to Hydrogen Sulfide Most Other Products



## Cons:

- High Material Price
- Shorter Window of Workability
- Highly Sensitive to Water Ratio (More Skilled Applicator Needed)





# GEOPOLYMER MORTAR

- QUADDEX – GEOKRETE
- CLOCKSPrING NRI GEOSPrAY (MILLIKEN)
- PARSONS - GEOLINER



# #5\_PORTLAND BLEND WITH ANTI MICROBIAL ADDITIVE DESIGN

- STRUCTURAL REPAIR, INFILTRATION ELIMINATION & FOR CORROSION PROTECTION IN HIGH H<sub>2</sub>S ENVIRONMENTS – 8k-10k psi
- SETS AND CURES QUICKLY - PRODUCT MAY FLASH SET DURING MIXING & SPRAYING OPERATION – HARD WITHIN 3-4 HOURS!!!



Pros:

- Higher Resistance to Hydrogen Sulfide than Most Other Products



Cons:

- High Material Price
- Microbial Additive Added in Field During Batching (Source of Error)



# ANTI MICROBIAL ADDITIVE

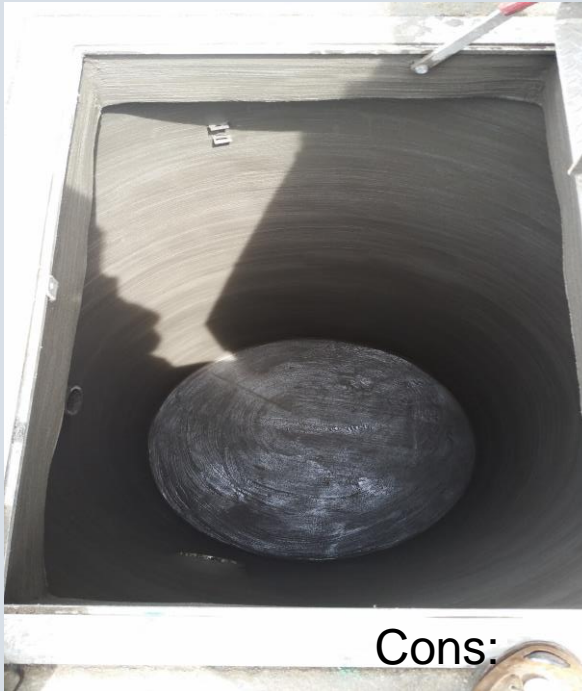
- PERMAFORM – CONSHIELD W/ MS 10,000





# #5\_COMPOSITE EPOXY/CEMENT DESIGN

- CORROSION PROTECTION IN HIGH H<sub>2</sub>S ENVIRONMENTS – ALSO HIGH BUILDS ARE NOW BEING CALLED OUT FOR STRUCUTRAL REPAIRS
- SETS AND CURES IN ABOUT 18-24 HOURS
- PRODUCT IS 100% SOLIDS EPOXY AND GOES THROUGH A CHEMICAL REACTION PROCESS TO CURE



## Pros:

- Highest Resistance to Hydrogen Sulfide
- High Adhesion Strength

## Cons:

- High Material Price
- High Level Of Preparation





# #6\_100% EPOXY DESIGN

- CORROSION PROTECTION IN HIGH H<sub>2</sub>S ENVIRONMENTS – ALSO HIGH BUILDS ARE NOW BEING CALLED OUT FOR STRUCUTRAL REPAIRS
- SETS AND CURES IN ABOUT 18-24 HOURS

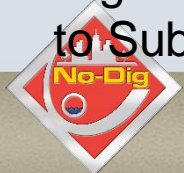


Cons:

Pros:

- Highest Resistance to Hydrogen Sulfide
- High Adhesion Strength to Substrate

- Highest Material Price
- High Level Of Preparation to Pressure Wash and Eliminate Active Infiltration



# EPOXY – 100% SOLIDS

- RAVEN – RAVEN 405
- SAUEREISEN – 210X
- PARSONS – SEL- 80
- QUADDEX – STRUCTURE GUARD
- STRONG SEAL – STRONG SEAL EPOXY
- SHERWIN WILLIAMS – DURAPLATE 6100
- NEOPOXY INTERNATIONAL – NEOPOXY 5300
- WARREN ENVIRONMENTAL – WARREN 301
- PERMAFORM – COR-GARD



# #7\_MANHOLE CHIMNEY SEAL DESIGN

- TO STOP INFILTRATION AT THE JOINT OF THE MANHOLE FRAME AND CHIMNEY AREA
- SETS AND CURES IN ABOUT 18-24 HOURS
- PRODUCT IS A FLEXIBLE EPOXY WITH ELONGATIONS OF 400%-800%



## Pros:

- Extremely Effective To Reduce Pavement Failure

## Cons:

- High Level Of Preparation
- Strict Installation Procedures





# CHIMNEY SEALS

- RAVEN – RAVEN 581
- SEALING SYSTEMS – SSI FLEX SEAL
- SAUEREISEN – F-88
- PARSONS – FP
- QUADDEX – CHIMNEY GUARD
- SHERWIN WILLIAMS – AR530
- WARREN ENVIRONMENTAL – WARREN 301-21 ULTRAFLEX
- CRETEX – LSS INTERNAL CHIMNEY SEAL





# Thank You & Questions?

Dennis Sullivan PE– National Water Main Cleaning  
Company – Carylton Company (NWMCC)

Dennis@nwmcc-bos.com

781-828-0863



James Fleming – National Water Main Cleaning  
Company – Carylton Company (NWMCC)

Jfleming@nwmcc-bos.com

781-828-0863

