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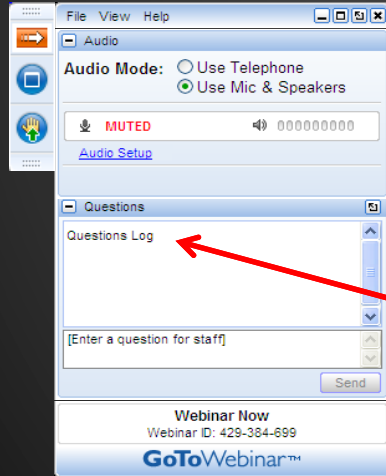
NASSCO Standard Specification Guidelines for CIPP, Manholes and More

June 23, 2015

1:00 - 3:00 pm Eastern



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Today's Moderator

Ted DeBoda, P.E.,
Executive Director,
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www.nassco.org




NASSCO Standard Specification Guidelines for CIPP, Manholes and More




PERFORMANCE SPECIFICATION GUIDELINE
FOR THE
INSTALLATION OF
CURED-IN-PLACE PIPE (CIPP)
June, 2011

Thanks to the following participants for the development of this document:
Ted DeBoda - NASSCO
Steve Gearhart - CIPP Corp.
Steve Hitz - SAK Construction
Gerry Muenchmeyer - Muenchmeyer Associates, LLC (Chair)
Lynn Osborn - Insulform Technologies
NASSCO CIPP Committee




PERFORMANCE SPECIFICATION GUIDELINE
FOR
MANHOLE REHABILITATION
December, 2013

Thanks to the following participants for the development of this document:
Victor Anzola - Chicago, Illinois
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Bob O'Connor - Municipal & Contractors Sealing Products
Vaughn O'Neil - Tremeac Company
Gilbert O'Neil - Green Seal Coating Services, LLC
John Schroeder - CDM Smith







PERFORMANCE SPECIFICATION GUIDELINE
FOR
PIPE CONDITION ASSESSMENT USING CCTV



PERFORMANCE SPECIFICATION GUIDELINE
FOR THE
INSTALLATION OF
FOLDED (THERMOPLASTIC) PIPE (FP)

www.nassco.org

Today's Presenters



Lynn Osborn, P.E.



Gerry Muenchmeyer, P.E.






NASSCO Standard Specification Guidelines for CIPP



Lynn Osborn, PE

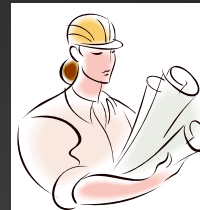


Effective Specifications

The preparation of effective bid specifications are critical to project success.

Project success includes:

- Product selection for the best solution
- Definition of project goals and requirements
- Construction means and methods as defined by the contractor
- Product provided and installed as specified by the product manufacturer
- Product quality confirmed through inspection and testing
- Product design life and service life verified through warranty inspection



Prescriptive Specifications

- The design engineer's required means and methods to be implemented by the contractor to achieve the project results.
- If the means and methods are properly executed but the results are not achieved, who is responsible?



Performance Specifications

- Require that the contractor use whatever innovative means available to deliver a specified product at a defined level of quality.
- Requires that the contractor, not the engineer, define the means and methods by submitting a detailed Performance Work Statement (PWS)
- If the means and methods are properly executed but the defined level of quality is not achieved, who is responsible?



Combination Specifications

- The contractor is required to define the means and methods for installation, but the engineer also defines certain installation criteria.
- Who is responsible for unacceptable results if:
 - Some means and methods are defined by the contractor
 - Additional means and methods are defined by the engineer



Performance Specifications Guidelines (CIPP) PART 1.0

- 1.0 General
- 1.1 Description of Work and Product Delivery
- 1.2 References
- 1.3 Performance Work Statement (PWS) Submittal
- 1.4 Product Submittals
- 1.5 Safety
- 1.6 Quality Control Plan (QCP)
- 1.7 CIPP Repair/Replacement
- 1.8 As-Built Drawings
- 1.9 Warranty



General

Minimum requirements for the rehabilitation of sanitary sewers by CIPP

- Installation of a resin-impregnated flexible tube
- Extend the full length of the original pipe and provide a structurally sound, joint-less and water-tight new pipe-within-a-pipe.
- CIPP should not cause adverse effects to any of the Owner's processes or facilities.
- CIPP installation should cause the least possible obstruction and inconvenience to traffic, pedestrians, businesses, and property owners or tenants.



Description of Work & Product Delivery

- Detailed description of the work required
- All that is included in the installation
- What is to be delivered by the contractor
- Continuous from MH to MH
- Proper fit in the host pipe & visual appearance
- Expected or anticipated product life
- Long-term corrosion resistance
- Other



References



Typical Reference Statement

- The following documents form a part of this specification to the extent stated herein and should be the latest editions thereof. Where differences exist between codes and standards, the requirements of these specifications should apply. All references to codes and standards should be to the latest revised version.
- Reference documents could include ASTM, NASSCO, AWWA, ASCE, etc.
- Specific reference document requirements such as quality control, inspection and testing should be defined in the contract documents or by reference to a specific section of the document.



Performance Work Statement (PWS) Submittal

The contractor defines the installation means and methods and submits a written plan (PWS).

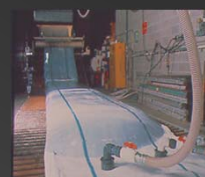
PWS Submittal examples might include:

- Statement of product conformance to the contract documents
 - Installation to manufacturers recommended standards
 - Detailed installation plan
 - Statement of contractor experience & lead personnel
 - CIPP wall thickness to be installed
 - Manufacturers technical data
 - Listing of redundant tools & equipment
 - Proposed public notification program
 - Odor control plan during installation
 - Manufacturer recommended CIPP repair/replacement procedures if required
- And more.....



Product Submittals

- Fabric Tube
 - Flexible membrane (coating) material
- Raw Resin Data
- Manufacturers' shipping, storage and handling recommendations.
- All Safety Data Sheets (SDS)
- Tube wet-out, installation & cure method including:
 - Wet-out procedure for the proposed technology.
 - Proposed installation process
 - The CIPP Manufacturer's recommended cure method and schedule



Safety

- The Contractor should conform to all work safety requirements of pertinent regulatory agencies.
 - Including applicable OSHA standards.
- Requirements for entering confined spaces.
- Submit a proposed Safety Plan to the Owner
 - Description of a daily safety program and all emergency procedures
- All work should be conducted in accordance with the Contractor's submitted Safety Plan.



Quality Control Plan (QCP)

A quality control plan (QCP) should be submitted. At a minimum the QCP should include the following:

- A discussion of the proposed quality controls.
- Defined responsibilities for assuring that all quality requirements are met.
 - These should be assigned to specific contractor personnel.
- Proposed procedures for quality control including product sampling and testing.
- Reviews between the Contractor and the Owner at a regularly scheduled meeting.
- Inspection forms and guidelines for quality control inspections should be prepared in accordance with the standards specified and submitted with the QCP.



CIPP Repair/Replacement

Specific repair or replacement procedures should be defined by the contractor.

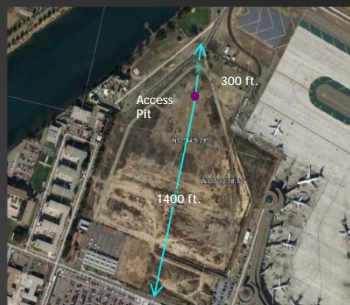
Recommendations by the CIPP system manufacturer include:

- Issues in the installed CIPP that will not affect the operation and longevity of the product should be identified and defined.
- Repairable defects: Repairs based on manufacturer's recommendations
 - Including a detailed step-by-step repair procedure
- Defects not repairable based on the manufacturer's recommendations
 - Including recommended procedures for the removal and replacement of the defect or CIPP.



As-Built Documents

- As-Built drawings include the identification of the work completed by the Contractor
- Should include pre & post inspection documentation.
- As-Built drawings should be kept on the project site at all times.



Warranty

- The materials used for the project should be certified by the manufacturer for the specified purpose.
- The Contractor should warrant the CIPP material and installation for a period as specified.
- On any work completed that is defective and/or has been repaired, the contractor may warrant this work for an extended period.
- After a period of time following completion of the project, the Owner should inspect all or portions of the lined system.

The specific locations will be selected at random by the Owner.



CIPP Part 2.0 Products

- Materials
- Fabric Tube
- Resin
- Structural Requirements
- Minimum Physical Properties



Materials

- The CIPP System must meet the chemical resistance requirements specified.
- All shipped materials should be accompanied by test reports certifying that the material conforms to the specified ASTM standards.
- Materials should be shipped, stored, and handled in a manner consistent with written recommendations of the CIPP system manufacturer.



Materials

- Damage may include gouging, abrasion, flattening, cutting, puncturing, or ultra-violet (UV) degradation.
- On site storage locations should be approved by the Owner
- Damaged materials should be promptly repaired or removed.



Fabric Tube

- Layers of non-woven felt fabric, felt/fiberglass or fiberglass that meet the requirements of ASTM F1216, F1743, D5813 or F2019.
- Should meet or exceed the design thickness after cure.
- Will tightly fit the internal circumference of the original pipe.
- Determine the minimum tube length necessary to effectively span the designated run between manholes.



Fabric Tube

- Verify the lengths in the field prior to ordering or wet out of the tube.
- Measure the inside diameter of the existing pipelines in the field prior to ordering or wet out of the tube.
- The outside and/or inside layer of the fabric tube (before inversion or pull-in) should be coated with an impermeable, flexible membrane.



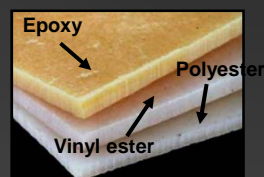
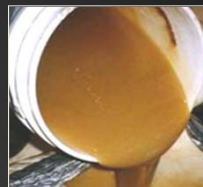
Fabric Tube

- No material should be included in the fabric tube that may cause delamination in the cured CIPP.
- No dry or unsaturated layers should be acceptable.
- Seams in the fabric tube should meet the requirements of ASTM D5813.
- The outside of the fabric tube should be marked every 5 feet with the name of the manufacturer or CIPP system, manufacturing lot and production footage.



Resin

- The resin should be a corrosion resistant polyester or vinyl ester resin and catalyst system or epoxy and hardener system as specified
- When properly cured within the tube composite, the CIPP should meet the requirements of ASTM F1216, F1743 or F2019 and the physical properties used in thickness design.
- The resin should produce CIPP which will comply with or exceed the structural and chemical resistance requirements of the specification.
- Resin quantities, as supplied by the manufacturer, should be verified at wet out.



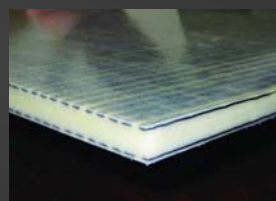
Structural Requirements

- The CIPP system should meet or exceed the minimum physical properties specified or used for design.
- The CIPP should be designed as per ASTM F1216 Appendixes.
- The CIPP design should assume no bonding to the original pipe wall.
- For unreinforced CIPP, set the long-term Creep Retention Factor at 50% of the initial design flexural modulus as determined by ASTM D790.
 - This value should be used unless the Contractor submits long term test data (ASTM D2990) to substantiate a higher retention factor.



Minimum Physical Properties

Property	Test Method	ASTM F 1216*	Design Value
Flexural Modulus of Elasticity	ASTM D 790	250,000 psi	Contractor Value
Flexural Strength	ASTM D 790	4,500 psi	
*For Unreinforced Tubes Reinforced Tubes as recommended by the Manufacturer			
Design Safety Factor	2.0 (1.5 for pipes 36" or larger)		
Creep Retention Factor	50%		
Ovality	2% or as measured		
Constrained Soil Modulus	Per AASHTO LRFD Section 12 and AWWA Manual M45		
Groundwater Depth	Contract Documents		
Soil Depth (above the crown)	Contract Documents		
Live Load	Highway, railroad or airport		
Soil Load (assumed)	120 lb/cu. ft. or as specified		
Minimum service life	50 years		



CIPP Part 3.0 Installation

- Construction Requirements
- Installation of Liner
- Cool Down
- Finish
- Manhole Connections and Reconnections of Existing Services
- Testing of Installed CIPP
- Final Acceptance



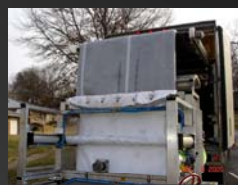
Construction Requirements

- Furnish all labor and equipment necessary to complete the work.
- Furnish a detailed traffic control plan.
- Remove all internal debris from the pipe that will interfere with the installation and the final product.
- Provide by-passing for existing sewage flows, if necessary.
- Perform post-cleaning video inspections of the pipelines.



Construction Requirements

- Remove line obstructions.
- Confirm the locations of all branch service connections prior to installing the CIPP.
- Typically only service connections deemed "active" by the owner should be reopened.
- The Contractor should be allowed to use water from an owner-approved fire hydrant in.



Installation of the CIPP

- The CIPP should be installed and cured per the manufacturer's specifications as described in the PWS.
- CIPP installation should be in accordance with the applicable ASTM standards
- Prior to installation, remote temperature sensors should be placed inside the host pipe to monitor temperatures during the cure cycle.
- Interface temperatures (between the tube and host pipe @ 6:00 o'clock) should be monitored and logged during cure.



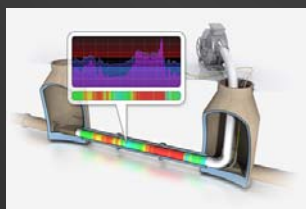
Installation of the CIPP

- The manufacturer's cure method & schedule should be used for each line segment installed.
- Each sensor should record both the maximum and the specified cool down temperature.
- For UV Cured CIPP, all light train sensor readings should provide output documenting the cure along the length of the installed CIPP.
- The cure procedure should be in accordance with the manufacturers recommendations as included in the PWS.



Cool Down

- Cool the CIPP in accordance with the CIPP manufacturer's recommendations as described in the PWS.
- Temperatures and curing data should be monitored and recorded throughout the installation process.



Finish

- The installed CIPP should be continuous over the entire length of a sewer line section and be free from significant visual defects such as foreign inclusions, dry spots, pinholes, major wrinkles and delamination.
- The CIPP should be free of leakage from the pipe to the surrounding ground or from the ground to inside the CIPP.
- Any defect, which could affect the structural integrity of the CIPP, should be repaired in accordance with the procedures submitted.



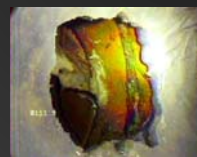
Finish

- The beginning and end of the CIPP should be sealed to the existing host pipe.
- If specified, any service connections that leak water between the host pipe and the installed CIPP should be sealed to provide a water tight connection.
- If the wall of the CIPP leaks, it should be repaired or removed and replaced with a watertight product.



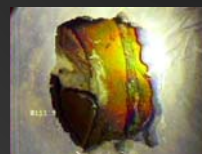
Manhole Connections & Reconnections of Existing Services

- A hydrophilic rubber seal should be applied at the CIPP and manhole wall interface.
- It is the CONTRACTOR'S responsibility to make sure that all active service connections, as reviewed by the Owner, are reconnected.
- External reconnections should be made in accordance with the CIPP System manufacturer's recommendations.
- Saddle connections should be sealed to the CIPP using grout or resin compatible with the CIPP.



Manhole Connections & Reconnections of Existing Services

- The machined opening should be at least 90 percent of the service connection opening.
 - The invert of the connection should be cut flush with the invert entering the mainline.
 - The opening should not be more than 100 percent of the service connection opening.
- The edges should not have fragments which may obstruct flow.
- For openings greater than 100 percent, the Contractor should install a CIPP type repair.
- Coupons of pipe material resulting from service tap cutting should be collected.



Testing of Installed CIPP

- Physical properties should be verified through field sampling and testing.
- All tests should be in accordance with applicable ASTM test methods.
- Testing requirements and payment should be clearly defined.
- Provide a sample for every line section installed.
- The sample should be prepared as per ASTM F1216.



Testing of Installed CIPP

- Sample chain of custody should be maintained by the Owner's representative.
- For pipes > 18 inches in diameter, the Owner may require plate samples.
- If properties tested do not meet the minimum physical or thickness requirements, the CIPP should be repaired, relined or replaced by the Contractor unless:
The actual physical properties and the thickness of the sample tested meet the design requirements of the contract.



Testing of Installed CIPP

- Chemical resistance - as per ASTM D5813 or F1216.
 - Qualification test where CIPP samples tested should be of fabric tube and the resin proposed for actual construction.
 - A certification may be submitted from the manufacturer verifying that the chemical resistance of the CIPP meets the contract requirements.
- The hydraulic capacity should be maintained as large as possible.
- The installed CIPP thickness should be measured for each line section installed.
- The CIPP thickness should have tolerance of minus 5%, plus 10%.
- In man-entry size piping, the Contractor should remove a minimum of one sample per line section of installed CIPP to be used to check the CIPP thickness.



Final Acceptance

- All sample testing and repairs to the installed CIPP should be completed before final acceptance.
- Test results and repairs should meet the requirements of the specifications and be documented in written form.
- The Contractor should perform a detailed CCTV inspection in the presence of the Owner after installation of the CIPP and reconnection of service connections.



Final Acceptance

- The finished CIPP should be continuous over the entire length of the installation and should be free of significant visual defects, damage, deflection, holes, leaks and other defects.
- Collected data should note the inspection date, location of all reconnected service connections, as well as any other defects in the CIPP.
- If post installation inspection documentation is not submitted within 10 working days of installation, the Owner may suspend further installations until the documentation is submitted.



Final Acceptance

- Prior to conducting the CCTV, the Contractor should thoroughly clean the newly installed CIPP.
- Bypass pumping or plugging from the upstream manhole should be utilized to minimize sewage from entering the line during the inspection.
- The CIPP should be cleared of any standing water to provide continuous visibility.
- Where leakage is observed through the wall of the pipe, the contractor may institute additional testing that will verify that the leakage rate does not exceed acceptable specified tolerances.



Typical Bid Items

- Mobilization - Lump Sum - Includes all PWS information, submittals, safety plan, as-built drawings, testing samples, mobilization/demobilization of labor, equipment and materials to the project site. Generally limited to 5% of the total amount bid for the project.
- Pre-Lining CCTV Inspection - Per linear foot - Includes pre-cleaning and post cleaning CCTV for Owner review. Does not include CCTV inspection just prior to CIPP installation. All inspections will be performed by PACP trained and certified personnel.
- Dye Testing of Service Connections - Per each -Includes dye testing and documentation of existing service connection on each pipe length to be lined.



Typical Bid Items

- Point Repairs - Per each or by Lump Sum
Contingency- Includes excavation and restoration of a section or sections of pipe that are beyond rehabilitation using a CIPP. Note: Point repair items should be categorized by pipe size, a minimum length of excavation and depth category of excavation to be paid for in the Proposal. If point repairs are not identified in the contract documents payment should be on a contingency basis.
- Standard Pipe Cleaning - Per linear foot for each pipe size category - including all labor, equipment, materials and cost of material disposal.



Typical Bid Items

- Heavy Pipe Cleaning - Per linear foot for each pipe category - including all labor, equipment, materials and cost of material disposal.
- Inspector training - Lump Sum - includes all labor equipment and materials required to train the Owner's inspectors on the technology to be installed.
- CIPP Installation - Per linear foot for each pipe size category - Includes all labor, equipment and materials required for the complete installation of a CIPP.



Typical Bid Items

- Traffic Control -Lump Sum - Includes all labor, equipment and material required to implement a traffic control plan for the entire project and should include all costs associated with sub-contracted traffic control specialists.
- Sewage By-pass - Lump Sum - Includes all labor, equipment and materials required, to implement a sewage by-pass plan for the entire project, including the cost of all sub-contracted sewage by-pass specialists.



Typical Bid Items

- Service Reconnections - Per each - Includes reconnecting existing live sewer service connections to the installed CIPP. Owner should review and verify those connections that are not live and will be left unopened.
- Service connection sealing - Per each - Includes sealing the interface between the installed CIPP and the host pipe at the location of the service connection.
- Manhole/ Wall Interface Sealing - Per each - Includes sealing the interface between the CIPP and the manhole wall.



Typical Bid Items

- Post Construction CCTV Inspection - Per linear foot - Includes post lining CCTV for submission to the Owner. All inspections will be performed by PACP trained and certified personnel.
- Reserve for Testing - Lump Sum Reserve - For Owners use to include testing under the contract by an independent laboratory. (The amount will be set by the Owner in the Bid Proposal)



Summary

- Performance specifications are the directions and guidance for contractor installation and owner measurement, inspection, testing and documentation.
- The intent of the contract needs to be clearly defined.
- The products to be provided by the contractor should be defined as to quantity and quality in the specifications.



Summary

- The measurement, inspection, testing and documentation requirements should be clearly defined in the specification.
- Payment for all contractor work should be defined.
- Payment for all measurement, inspection and testing should be defined.



Manhole Specifications

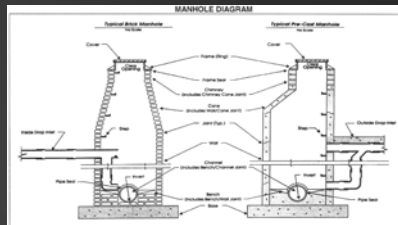


Gerry Muenchmeyer, P.E.



Manhole Rehabilitation Approach

- The rehabilitation of manholes can be complicated
- Selection of the product or technology can, at times, be confusing.
- There are many methods available
- Each method must be evaluated to determine its applicability
- Develop the best approach towards rehabilitation and what family of products best meet specific project requirements.



Manhole Evaluation

Thoroughly evaluate the condition of the manhole to be rehabilitated using the Manhole Assessment Certification Program (MACP) as developed by NASSCO for providing a uniform coding for the defects typically found in a manhole structure.



Define Manhole Defects

Define the type of defects that exist in the manhole These could be:

- Structural
- Operational
- Maintenance
- Construction features



Rehabilitation/Reconstruction Technologies

Technologies can be classified into general rehabilitation needs including:

- Grouting,
- Cementitious reconstruction
- Polymer coatings/linings
- Cured-in-place lining
- Panel liners
- Mechanical seals
- Bench and channel inserts



Technology Selection

- What are the defects ?
- Does technology provide the desired long-term solution?
- Does technology go beyond solving the immediate?
- Does technology ensure compatibility of all materials?
- Is it relatively well suited for the project site conditions?
- Select proven installation techniques.
- Contractor capabilities and experience quantifiable?
- Can the qualifications of the crew be verified?



Technology Verification

- Many products technologies and variations available
- Contact product manufacturer discuss the and verify product compatibilities.
- Require supporting documentation and third party testing

Multiple technologies may be required to totally rehabilitate the manhole structure. Products and Technologies include:



Manhole Technology Descriptions

1. Chemical Grouting - Generally used for leakage or I&I problems.

2. Cementitious Manhole Restoration - Cementitious materials can be Portland Cement, Microsilica enhanced, Calcium Aluminate, or Geopolymer based.

- The Geopolymer, Calcium Aluminates and Microsilica cements typically have a higher resistance to corrosion and typically attain high structural strength
- Cementitious materials can be trowelled, sprayed, spun cast or poured in place.
- Generally used for structural reconstruction, elimination of I&I and prevention against low levels of corrosion. A base coating before applying a polymer top coat.

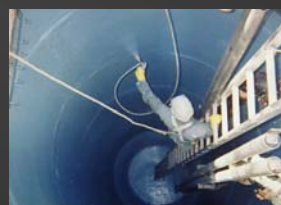


Manhole Technology Descriptions

3. Polymers (Epoxy, Polyurethane, Polyurea Coatings) - Generally used for corrosion protection and to eliminate I&I.

When applying multiple components it is extremely important that all components are compatible with each other and each is properly cured and prepared before the application of the next product.

The Manufacturer of each system should be contacted to determine compatibility



Manhole Technology Descriptions

4. Cured-In-Place Liners - Structural reconstruction of a manhole, I&I removal and corrosion protection. The process includes the installation of a specifically designed resin saturated, fabric liner



5. Panel Liners - Generally non-structural liners used for corrosion protection and elimination of I&I. Usually installed in the form of panels, thermally welded at the seams and mechanically anchored or glued to the manhole wall



6. Chimney Seals - Used for defects in the adjustable portion of the manhole. Seals can be applied both internally and externally to the manhole structure and can be comprised of polymer applied, cured-in-place or rubber mechanical composition.



Technology Descriptions

7. Barrel Joint Seals - For joints between pre-cast manhole sections

8. Bench and Channel Inserts - Preformed corrosion resistant inserts installed in the bench and channel

9. Dish Inserts - Prevents water from entering through the manhole cover holes during rainfall events.



NASSCO PERFORMANCE SPECIFICATION GUIDELINE FOR MANHOLE REHABILITATION



Specifications Guidelines - Part 1.0

- DESCRIPTION OF WORK AND PRODUCT DELIVERY
- SCOPE OF WORK INCLUDED
- PERFORMANCE WORK STATEMENT (PWS) SUBMITTAL
- SUBMITTALS
- QUALITY CONTROL PLAN (QCP)
- SYSTEM REPAIR/REPLACEMENT
- REFERENCES
- DELIVERY, STORAGE AND HANDLING
- INSPECTOR TRAINING
- SAFETY
- WARRANTY
- WARRANTY INSPECTIONS
- MEASUREMENT AND PAYMENT

Detailed discussions of project requirements

References such as ASTM are commonly included in the contract documents. These are non-mandatory industry recommended standards. Requires detailed references, are required in the contract, to specific ASTM requirements

Warranty inspection must be mandatory and more frequent than other technologies. Failure of a coating material will occur at a faster rate than lining technologies



Specifications Guidelines - Part 2.0 Rehabilitation Component System Products

CHEMICAL GROUTS
CEMENTITIOUS MANHOLE
RESTORATION
CAST-IN-PLACE CONCRETE
RESTORATION
POLYMER SYSTEMS
CURED-IN-PLACE MANHOLE
LINERS
COMPOSITE LINER
CONCRETE PROTECTIVE LINERS
FRP MANHOLE INSERTS
MANHOLE CHIMNEY SEALS
REPLACE MANHOLE FRAME AND
COVER
MANHOLE ADJUSTMENT
MATERIALS
MANHOLE STEPS

Part 2.0 Products includes over a dozen technologies/products

- General introduction
- References for each product
- Repair/resurfacing material compatibility

Typically a manhole rehabilitation project may include one or more of these products.



Specifications Guidelines Part 3.0 Execution

CHEMICAL GROUT
CEMENTITIOUS RESTORATION
CAST-IN-PLACE CONCRETE LINER
POLYMER LINERS
CURED-IN-PLACE MANHOLE LINERS (CIPM)
COMPOSITE LINER
PROTECTIVE PANEL LINERS
PRECAST INSERTS
MANHOLE CHIMNEY SEALS
REPLACE FRAME AND COVER
MANHOLE ADJUSTMENT MATERIALS
MANHOLE STEPS

Part 3.0 Execution includes

- General overview
- Structure preparation
- Repair product compatibility
- Product execution
- Testing & inspection

Each technology is individually defined in the specifications



Quality Assurance

A. GENERAL

The Contractor should test the installed SYSTEM's as specified by these contract documents.

Typically 10% of the installed SYSTEM's should be tested using a testing procedure as specified

If more than 5% of the tested SYSTEM's fail the test than an additional 10% of the manholes are tested

This process continues until the SYSTEM's tested meet the requirements of these contract documents



Quality Assurance

B. CHAIN OF CUSTODY

The Contractor shall perform all testing in the presence of the Owner's representative.

The Owner's representative shall receive test samples from the Contractor and transmit samples to a third party testing laboratory.

The Owner's representative will maintain the chain of custody of all samples that are transmitted and tested to verify SYSTEM compliance with these contract documents.



Testing

1. Visual Inspection

All manholes shall be visually inspected.



2. Cementitious Material Property Testing

Where specified one 2 X 2 inch sample cube shall be taken for every 50 bags of material used. Samples shall be sprayed in the presence of the Owner's representative and sent, by the Owner's representative, to an independent test laboratory for compression strength testing as described in ASTM C-109.



Testing

3. Vacuum Testing

Where specified if the entire manhole including invert and pipe penetrations is rehabilitated to as new condition then a Vacuum Test may be performed according ASTM F1244.



Testing

4. Film Thickness Measurements

During coating application, a wet film thickness gauge, meeting ASTM D4414 - Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notched Gages, should be used.



5. Holiday Detection Test

Where specified Holiday Detection shall be performed for all coating systems installed in corrosive environments.



Testing

6. Adhesion Testing

a. Where specified a minimum of 10% of the manholes coated shall be tested for adhesion/bond of the coating to the substrate. Testing shall be conducted in accordance with ASTM D4541, ASTM D7234, or NACE SP018. Owner's representative shall select the manholes to be tested.

b. A minimum of three (3) - 50 mm dollies shall be affixed to the coated surface at the cone area, mid section and at the bottom of the structure or in areas suspect from non-destructive evaluation and testing



Sample Bid Items

Mobilization - Lump Sum - Includes all PWS info, submittals, safety plan, as built drawings, test samples and mobilization/demobilization of labor, equipment and materials to the project site.

SYSTEM (One for each SYSTEM Specified)- Lump Sum - per each vertical foot

SYSTEM Inspector Training (One for each SYSTEM Specified) - price per day -

Replace Manhole Frame and Cover - Lump Sum - per each manhole

Manhole Adjustment Materials - per vertical inch

Bench Rebuild - per each

Manhole Steps - per each



Other Available NASSCO Specification Guidelines



Performance Specification Guideline for Pipe Condition Assessment using CCTV

PART 1 - GENERAL

- 1.1 SCOPE OF SERVICES AND WORK PHASING
- 1.2 OWNER
- 1.3 TIME OF PERFORMANCE, SCHEDULING AND LIQUIDATED DAMAGES
- 1.4 COMPLIANCE AND ACCEPTANCE
- 1.5 REFERENCED DOCUMENTS
- 1.6 SUBMITTALS

PART 2 - SPECIAL PROVISIONS

- 2.1 OWNER RIGHTS
- 2.2 EMERGENCY RESPONSE
- 2.3 WORKING HOURS
- 2.4 DECREASE/INCREASE IN SERVICE/STOP WORK DUE TO INCLEMENT WEATHER
- 2.5 PRE-CONSTRUCTION MEETING
- 2.6 CLOSE-OUT PROCEDURES
- 2.7 PRE-QUALIFICATIONS.....



Performance Specification Guideline for Pipe Condition Assessment using CCTV

PART 3 - GENERAL PROVISIONS

- 3.1 MAINTENANCE OF TRAFFIC
- 3.2 EXISTING UTILITIES
- 3.3 REQUEST FOR SUPPLEMENTARY INFORMATION
- 3.4 USE OF PREMISES
- 3.5 PROTECTION OF TREES
- 3.6 FENCING
- 3.7 RESTORATION
- 3.8 CLEANUP
- 3.9 PROPERTY DAMAGE
- 3.10 ACCESS TO MUNICIPAL WATER SUPPLIES



PART 4 - EXECUTION

- 4.1 GENERAL
- 4.2 TELEVISION INSPECTION AND COMPUTERIZED EQUIPMENT

PART 5 - PAYMENT FOR WORK

- 5.1 MEASUREMENT AND PAYMENT



Sewer Pipe Cleaning- Guideline Specification

PART 1 - GENERAL

- 1.1 SCOPE OF SERVICES AND WORK PHASING
- 1.2 OWNER
- 1.3 TIME OF PERFORMANCE, SCHEDULING AND LIQUIDATED DAMAGES
- 1.4 COMPLIANCE AND ACCEPTANCE
- 1.5 REFERENCED DOCUMENTS
- 1.6 SUBMITTALS

PART 2 - SPECIAL PROVISIONS

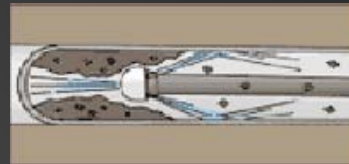
- 2.1 OWNER RIGHTS
- 2.2 EMERGENCY RESPONSE
- 2.3 WORKING HOURS
- 2.4 DECREASE/INCREASE IN SERVICE AND STOP WORK DUE TO INCLEMENT WEATHER
- 2.5 PRE-CONSTRUCTION MEETING
- 2.6 CLOSE-OUT PROCEDURES
- 2.7 PRE-QUALIFICATIONS



Sewer Pipe Cleaning- Guideline Specification

PART 3 - GENERAL PROVISIONS

- 3.1 MAINTENANCE OF TRAFFIC
- 3.2 EXISTING UTILITIES
- 3.3 REQUEST FOR SUPPLEMENTARY INFORMATION
- 3.4 USE OF PREMISES
- 3.5 PROTECTION OF TREES
- 3.6 FENCING
- 3.7 RESTORATION
- 3.8 CLEANUP
- 3.9 PROPERTY DAMAGE
- 3.11 ACCESS TO MUNICIPAL WATER SUPPLIES



PART 4 - EXECUTION

- 4.1 GENERAL
- 4.2 SEWER CLEANING AND GRINDING OF SERVICE CONNECTIONS
- 4.3 TELEVISION INSPECTION AND COMPUTERIZED EQUIPMENT



NASSCO
FORCE MAIN INSPECTION TECHNOLOGY SUMMARY

TECHNOLOGY	APPLICABLE DRAINAGE RANGE	PIPE MATERIAL			PIPE STATUS DURING TEST			TEST CONDITIONS	
		Steel	Concrete	Plastic	Visible	Obstructed	Restricted	Parameter Tracked	Comments
Remotely Operated Technologies/Technologies									
Internal Video Inspection	10" and larger	Yes	Yes	Yes	Yes	Yes	Yes	Internal video of pipe	For 10" and larger pipes, internal video inspection is the most accurate method for detecting defects.
Close Interval Sonar	10" and larger	Yes	Yes	Yes	Yes	Yes	Yes	Close interval sonar	Close interval sonar provides a detailed view of the pipe interior and can detect defects that are not visible to the naked eye.
Close Interval Television	10" and larger	Yes	Yes	Yes	Yes	Yes	Yes	Close interval television	Close interval television provides a detailed view of the pipe interior and can detect defects that are not visible to the naked eye.
Automated Close Interval Sonar	10" and larger	Yes	Yes	Yes	Yes	Yes	Yes	Automated close interval sonar	Automated close interval sonar provides a detailed view of the pipe interior and can detect defects that are not visible to the naked eye.
Automated Close Interval Television	10" and larger	Yes	Yes	Yes	Yes	Yes	Yes	Automated close interval television	Automated close interval television provides a detailed view of the pipe interior and can detect defects that are not visible to the naked eye.
Automated Close Interval Sonar and Television	10" and larger	Yes	Yes	Yes	Yes	Yes	Yes	Automated close interval sonar and television	Automated close interval sonar and television provides a detailed view of the pipe interior and can detect defects that are not visible to the naked eye.
Automated Close Interval Sonar and Television with Defect Detection	10" and larger	Yes	Yes	Yes	Yes	Yes	Yes	Automated close interval sonar and television with defect detection	Automated close interval sonar and television with defect detection provides a detailed view of the pipe interior and can detect defects that are not visible to the naked eye.
Automated Close Interval Sonar and Television with Defect Detection and Inflow/Infiltration Detection	10" and larger	Yes	Yes	Yes	Yes	Yes	Yes	Automated close interval sonar and television with defect detection and inflow/infiltration detection	Automated close interval sonar and television with defect detection and inflow/infiltration detection provides a detailed view of the pipe interior and can detect defects that are not visible to the naked eye.
Direct Assessment Technologies/Technologies									
Direct Assessment	10" and larger	Yes	Yes	Yes	Yes	Yes	Yes	Direct assessment	Direct assessment provides a detailed view of the pipe interior and can detect defects that are not visible to the naked eye.
Long Range Ultrasonic	10" and larger	Yes	Yes	Yes	Yes	Yes	Yes	Long range ultrasonic	Long range ultrasonic provides a detailed view of the pipe interior and can detect defects that are not visible to the naked eye.
Proprietary Fall Camera (PFC)	10" and larger	Yes	Yes	Yes	Yes	Yes	Yes	Proprietary fall camera	Proprietary fall camera provides a detailed view of the pipe interior and can detect defects that are not visible to the naked eye.
Robotic	10" and larger	Yes	Yes	Yes	Yes	Yes	Yes	Robotic	Robotic provides a detailed view of the pipe interior and can detect defects that are not visible to the naked eye.
Robotic with Close Interval Sonar	10" and larger	Yes	Yes	Yes	Yes	Yes	Yes	Robotic with close interval sonar	Robotic with close interval sonar provides a detailed view of the pipe interior and can detect defects that are not visible to the naked eye.
Robotic with Close Interval Television	10" and larger	Yes	Yes	Yes	Yes	Yes	Yes	Robotic with close interval television	Robotic with close interval television provides a detailed view of the pipe interior and can detect defects that are not visible to the naked eye.
Robotic with Close Interval Sonar and Television	10" and larger	Yes	Yes	Yes	Yes	Yes	Yes	Robotic with close interval sonar and television	Robotic with close interval sonar and television provides a detailed view of the pipe interior and can detect defects that are not visible to the naked eye.
Robotic with Close Interval Sonar and Television with Defect Detection	10" and larger	Yes	Yes	Yes	Yes	Yes	Yes	Robotic with close interval sonar and television with defect detection	Robotic with close interval sonar and television with defect detection provides a detailed view of the pipe interior and can detect defects that are not visible to the naked eye.
Robotic with Close Interval Sonar and Television with Defect Detection and Inflow/Infiltration Detection	10" and larger	Yes	Yes	Yes	Yes	Yes	Yes	Robotic with close interval sonar and television with defect detection and inflow/infiltration detection	Robotic with close interval sonar and television with defect detection and inflow/infiltration detection provides a detailed view of the pipe interior and can detect defects that are not visible to the naked eye.

Pressure Pipe- Guideline Matrix for Selection of Pressure Pipe Assessment Technologies



Smoke Testing- Guideline Specification and Data Dictionary

PART 1 - GENERAL BACKGROUND

- 1.1 SCOPE
- 1.2 REQUIREMENTS
- 1.3 PERSONNEL QUALIFICATIONS
- 1.4 NOTIFICATION

PART 2 - EQUIPMENT

- 2.1 BLOWERS
- 2.2 SMOKE PRODUCTION
- 2.3 OTHER EQUIPMENT

PART 3 - INSTALLATION

- 3.1 WORK PROGRESS
- 3.2 WORK SCHEDULE
- 3.3 PERFORMING THE TESTS



Pipe Bursting Gravity Sewer Mains With HDPE

PART 1 - GENERAL

- 1.1 DEFINITIONS
- 1.2 SCOPE
- 1.3 QUALIFICATIONS
- 1.4 SUBMITTAL

PART 2 - MATERIALS

- 2.1 HDPE PIPE
- 2.2 PIPE JOINING FOR TERMINAL SECTIONS OF HDPE PIPE
- 2.3 MATERIALS RELATED TO SEWER SERVICE CONNECTIONS
- 2.4 MATERIALS FOR SEALING MANHOLES

PART 3 - EQUIPMENT

PART 4 - EXECUTION

- 4.1 GENERAL
- 4.2 PREPARATION
- 4.3 INSERTION OF THE HDPE PIPE



Folded Pipe - Guideline Specifications

PART 1 - GENERAL

- 1.1 DESCRIPTION OF WORK AND PRODUCT DELIVERY
- 1.2 REFERENCES
- 1.3 PERFORMANCE WORK STATEMENT (PWS) SUBMITTAL
- 1.4 PRODUCT SUBMITTALS
- 1.5 SAFETY
- 1.6 QUALITY CONTROL PLAN (QCP)
- 1.7 FP REPAIR/REPLACEMENT
- 1.8 AS-BUILT DRAWINGS
- 1.9 WARRANTY

PART 2 - PRODUCTS

- 2.1 PIPE MATERIAL
- 2.2 STRUCTURAL REQUIREMENTS
- 2.3 MINIMUM PHYSICAL PROPERTIES



Folded Pipe - Guideline Specifications

PART 3 - INSTALLATION

- 3.1 CONSTRUCTION REQUIREMENTS
- 3.2 INSTALLATION OF FP
- 3.3 FINISH
- 3.4 MANHOLE CONNECTIONS AND RECONNECTIONS OF EXISTING SERVICES
- 3.5 TESTING OF INSTALLED FP
- 3.6 FINAL ACCEPTANCE
- 3.7 TYPICAL SUGGESTED BID ITEMS



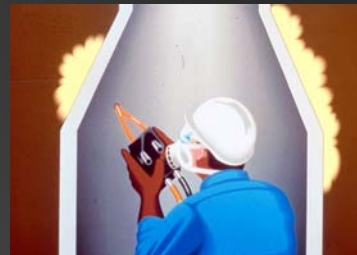
Suggested Standard Specification for Pressure Testing and Grouting

PART 1 - GENERAL

- 1.1 DESCRIPTION
- 1.2 REQUIREMENTS
- 1.3 RELATED SECTIONS
- 1.4 QUALIFICATIONS
- 1.5 SUBMITTALS
- 1.6 REFERENCE STANDARDS TO BE USED

PART 2 - PRODUCTS

- 2.1 TESTING EQUIPMENT & GROUTING EQUIPMENT
- 2.2 GROUTS - GENERAL
- 2.3 CHEMICAL GROUTS
- 2.4 ADDITIVES



Suggested Standard Specification for Pressure Testing and Grouting

PART 3 - EXECUTION

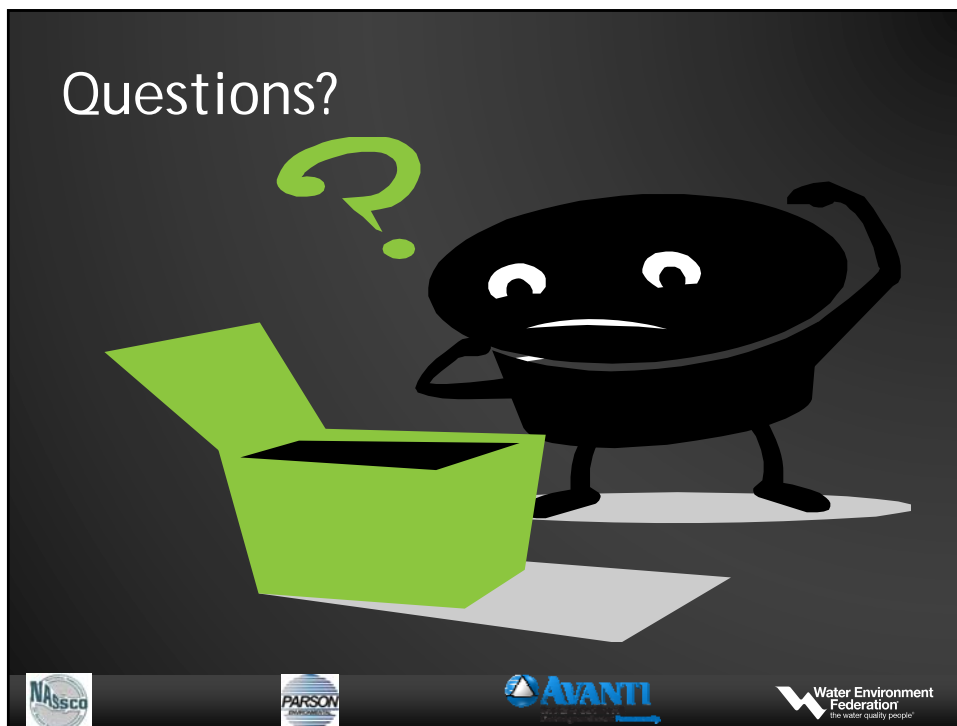
- 3.1 CONTROL TESTS
- 3.2 PIPE PREPARATION
- 3.3 ROOTS AND LOOSE DEBRIS IN LATERAL CONNECTIONS
- 3.4 GROUT PREPARATION
- 3.5 TESTING AND GROUTING DEFECTS
- 3.6 JOINT TESTING PROCEDURE FOR MAINLINE SEWER AND LATERALS CONNECTED TO MANHOLES
- 3.7 LATERAL CONNECTION TESTING PROCEDURE
- 3.8 GROUTING GENERAL
- 3.9 PIPE JOINT SEALING BY PACKER INJECTION GROUTING FOR MAINLINE SEWERS AND LATERALS CONNECTED TO MANHOLES
- 3.10 LATERAL CONNECTION SEALING FROM THE MAINLINE BY PACKER INJECTION GROUTING
- 3.11 JOINT SEALING VERIFICATION
- 3.12 DISPOSAL
- 3.13 POST-CONSTRUCTION INSPECTION
- 3.14 QUALITY CONTROL



Summary

- In addition to other industry standard and guidelines, NASSCO provides performance specification guidelines, written by industry professionals
- Additional specifications will become available as they are initiated and produced by NASSCO committee members and industry professionals







Parson Environmental Products, Inc.

Info@parsonenvironmental.com

800-356-9023



Mr. Craig Gaul



Providing Quality Products for Wastewater
Collection Systems • Since 1985

www.parsonenvironmental.com



Parson Manhole Inserts
Drastically reduce surface water inflow

Parson OdorEater Inserts
Eliminate unpleasant odors from manholes



Parson HDPE Insert



Parson Stainless Steel Insert



Parson OdorEater Insert



Parson HDPE Insert
Installed



Parson V2P HDPE Insert

www.parsonenvironmental.com



Stopping Leaks with Hydraulic Cements
Parson Quick Plug





PHYSICAL PROPERTIES
Set time ASTM C-191 60 seconds
Sulfate Resistance, Passed ASTM C-88
25 Cycles Min.
Freeze-Thaw Resistance C-666
100 Cycles, no damage
Bond Strength ASTM C-321 1 hour >400 psi 2
hours >1,000 psi
Shrinkage ASTM C-596 0% @ 90% RH

ADVANTAGES

Simple to use - Just add clean water
Stops leaks in approximately 1 minute!
Excellent freeze-thaw resistance
Nonmetallic

www.parsonenvironmental.com



Stopping Leaks with Urethane Grouts

Parson Seal Tite - - - Parson Hydro Grout
Parson Perma Seal



PARSON SEAL-TITE
ADVANTAGES Stops leaks up to 50gpm
Will not shrink
Non Hazardous - 100% Solids
Environmentally Friendly
Excellent Bond Strength
Will expand to 10 - 12 times liquid volume



PARSON PERMA SEAL
Single component
Hydrophilic Urethane Grout



PARSON HYDRO GROUT
Hydrophobic Urethane Grout



DRY OAKUM




INJECTION PORTS




Grout injection gun


www.parsonenvironmental.com



Parson's Fast Setting Bench and Invert repair products Save bypass time and money



Parson RPM
Cementitious patching material
ADVANTAGES
Repair benches and inverts quickly and easily
Withstand flows in approximately 30 minutes
Non-shrink
Excellent freeze - thaw resistance
Patch cracks and voids



PARSONPOXY FS1
Fast-set Epoxy Coating
ADVANTAGES
Non-toxic - 100% solids
Chemically resistant
No primer required
Return manholes to service quickly
Easy brush-on Application

www.parsonenvironmental.com

Cementitious Lining Products for Manhole Rehabilitation



PARSON MH LINER

High Strength,
fiber reinforced
Portland Cement Microsilica Mortar

PARSON CA LINER 100

High strength,
fiber-reinforced,
100% Calcium Aluminate Cement
with select aggregates

PARSON CA LINER 100+

High strength,
100% pure fused Calcium Aluminate
Cement with
Calcium Aluminate Aggregate



NEW!

**CONBLOCK MIC
Stops Growth of MIC**

An additive used with the Parson Cementitious line

www.parsonenvironmental.com

Parson's Cementitious products Can be hand applied, gun sprayed & spun cast



Spin Casting Cement



Gun Spraying Cement

www.parsonenvironmental.com

Epoxy Coatings Products for Manhole Rehabilitation



PARSONPOXY SEL-80

A corrosion resistant epoxy coating to protect concrete structures against H2S attack.

100% solids epoxy corrosion protection barrier applied at thicknesses up to 80 mils per coat. Easy application using a brush or single airless spray equipment.

PARSONPOXY SEL-80HB

Ultra High Build Epoxy Coating

Ultra High Build, 100% solids, corrosion resistant epoxy coating applied at thicknesses up to 125 mils per coat using specialized plural component spray equipment.

PARSON COMPOSITE LINER SYSTEM

Cement Mortar with Epoxy Corrosion barrier

Combines High Strength Mortar with a 100% solids Epoxy Corrosion Barrier in a same day application.



www.parsonenvironmental.com

Parson Epoxy can be brush applied sprayed and spun cast.



Gun spray Epoxy

Spin Casting Epoxy

www.parsonenvironmental.com

Equipment for Manhole Rehabilitation



Pro 50 Starter
Mortar mixer and pump



Grout pump



Epoxy sprayer



Mortar spinner



Grout injection gun



Epoxy spinner

www.parsonenvironmental.com

Stop I & I at The Chimney





PARSONPOXY FP

Flexible epoxy for manhole chimney
and joint rehabilitation

PHYSICAL PROPERTIES

Elongation ASTM D-412 600%

Tensile Strength ASTM D-412 1600 psi

Adhesion ASTM D-4541 350 psi (substrate failure)

Slant Shear Strength ASTM D-638 2000 psi

FLEX RIB SEALS

EPDM Rubber Chimney Seal

ADVANTAGES:

Allows vertical and horizontal movement

Provides watertight seal

Stainless Steel expansion bands

Manual or Hydraulic installation tool

www.parsonenvironmental.com

Accessories for Manhole Rehabilitation



MANHOLE COVER CUSHION
Quickly and easily
silence noisy manhole covers



MANHOLE COVER EXTRACTOR



VOLUMETRIC WEIRS
For measuring flows in Manholes
and Open End Pipes



PAVING RISERS
For Manholes, Catch Basins
& Valve Boxes



MANHOLE LID PULLER



MANHOLE STEPS
Polypropylene, drive-in style

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Mr. Craig Gaul




For Municipalities:
We can train you to do in-house

For Contractors:
We can help you start-up or
enhance your existing
MH Rehab division...

For Engineers:
Our specs are available





Providing Quality Products for Wastewater
Collection Systems • Since 1985
www.parsonenvironmental.com



Defeating Infiltration

DEFEATING INFILTRATION

Presenter:
DONALD RIGBY
VP Marketing & Education



Helping You Move Forward



Defeating Infiltration



WHERE

WHY

WHEN

WHO

WHAT

HOW

?



Helping You Move Forward

Defeating Infiltration

TOP 3 TAKEAWAYS

1. CIPP Lining and Injection Grouting are complimentary technologies



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Defeating Infiltration

TOP 3 TAKEAWAYS

1. CIPP Lining and Injection Grouting are complimentary technologies
2. Infiltration is the enemy



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Defeating Infiltration

TOP 3 TAKEAWAYS

1. CIPP Lining and Injection Grouting are complimentary technologies
2. Infiltration is the enemy
3. **Comprehensive, holistic approach**



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Defeating Infiltration

Consequence of Infiltration

1. **Sanitary Sewer Overflows (SSOs)**






Helping You Move Forward

Defeating Infiltration

Consequence of Infiltration

1. Sanitary Sewer Overflows (SSOs)
- 2. Sinkholes**



  **Helping You Move Forward**

Defeating Infiltration

Consequence of Infiltration

1. Sanitary Sewer Overflows (SSOs)
2. Sinkholes
- 3. Reduced Lifecycle**



  **Helping You Move Forward**

Defeating Infiltration

Consequence of Infiltration

1. Sanitary Sewer Overflows (SSOs)
2. Sinkholes
3. Reduced Lifecycle
- 4. Reduced Capacity**



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Defeating Infiltration

Consequence of Infiltration

1. Sanitary Sewer Overflows (SSOs)
2. Sinkholes
3. Reduced Lifecycle
4. Reduced Capacity
- 5. Customer Relations**



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Defeating Infiltration

Consequence of Infiltration

1. Sanitary Sewer Overflows (SSOs)
2. Sinkholes
3. Reduced Lifecycle
4. Reduced Capacity
5. Customer Relations
- 6. Increased Cost**

Year	Total	Sewer and stormwater	Water
'99	\$130.83	\$88.77	\$42.06
'00			
'01			
'02			
'03			
'04			
'05			
'06			
'07			
'08			
'09			
'10			
'11	\$235.11*	\$159.36*	\$75.75*

*If approved by council
Source: Portland Water Bureau; Bureau of Environmental Services
DAN AGUAYO/THE OREGONIAN

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Defeating Infiltration

Rehabilitation Technologies

- Dig and Replace
- Fold and Form
- Sectional Lining
- Pipe Bursting
- Slip Lining
- Cured in Place Pipe

How can I get the most for my money?

NAASCO **ICGA** **Helping You Move Forward**

Defeating Infiltration

Rehabilitation Technologies



- Dig and Replace
- Fold and Form
- Sectional Lining
- Pipe Bursting
- Slip Lining
- Cured in Place Pipe
- **Injection Grouting**

How can I get the most for my money?






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What is Injection Grouting?

Liquid resin that turns into an impermeable solid in a predictable time frame used to:

- stop leaks in above grade structures
- stop infiltration in below grade structures
- stabilize soils
- control groundwater
- seal annular space between host pipe & liner







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Primary Grout Families


- ACRYLIC GROUTS**
 - Acrylamide
 - NMA / Acrylic
 - Acrylate
- POLYURETHANE GROUTS**
 - Gel / Foam
 - Flexible / Rigid
- CEMENTITIOUS GROUTS**





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Typical Entry Points of Inflow and Infiltration



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Storm to Sanitary Trench

The diagram illustrates a cross-section of a trench system. A large concrete pipe, labeled 'SEWER TRENCH', runs horizontally. Above it, a smaller pipe labeled 'STORM TRENCH' is shown. Storm water is shown flowing from the storm trench into the sewer trench. Sewer water is shown flowing through the sewer trench. Labels include 'STORM TRENCH', 'SEWER WATER', 'STORM WATER', and 'SEWER TRENCH'. A globe icon is in the top right corner.

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Infiltration Points of Entry

The diagram shows a cross-section of a manhole and a service line. Water is shown infiltrating through the manhole walls, joints, and service line connections. Labels include 'Manhole', 'First Few Feet of the Service Line', 'Joints', and 'Service Line Connections'. A globe icon is in the top left corner.

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Grout Ring Outside Pipe Joint

Myth: Grout only seals in the pipe joint connection



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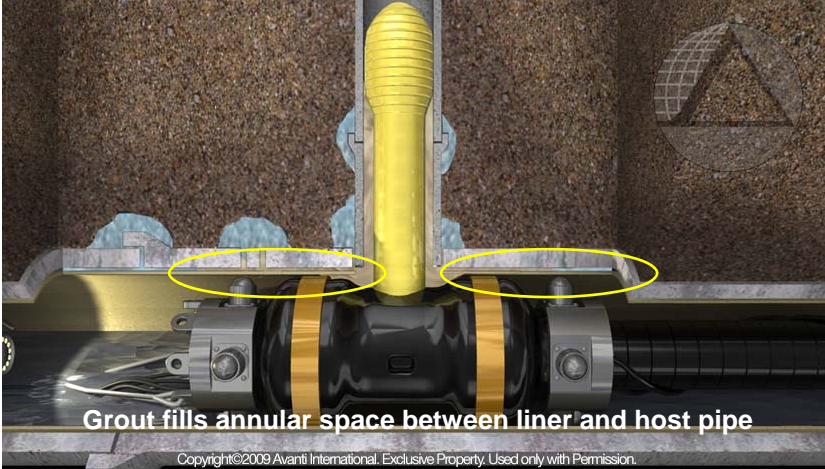
Fact: Grout forms an impermeable gel/soil matrix outside the pipe

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Grouting Laterals Stops Infiltration



Grout fills annular space between liner and host pipe



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Sullivan's Island, SC



Helping You Move Forward

Defeating Infiltration

Naperville, IL



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Defeating Infiltration

Naperville, IL



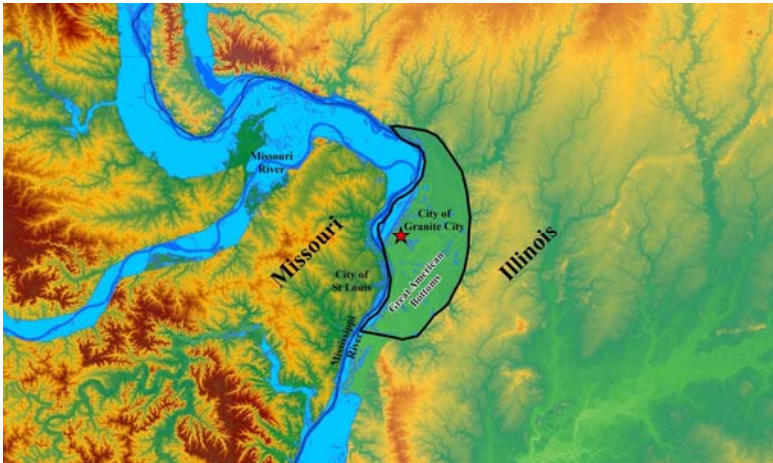
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Defeating Infiltration

Granite City, IL



Missouri River

City of St. Louis

City of Granite City

Granite City Region

Missouri

Illinois

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Helping You Move Forward

Defeating Infiltration

Granite City, IL



Helping You Move Forward


NAASCO ICGA

This slide features a decorative blue water splash at the top. The main title is 'Granite City, IL'. Below it is a photograph of two workers in a tunnel, one wearing a yellow hard hat and the other a white one, both in safety gear. The tunnel is supported by blue metal structures. At the bottom left are the NAASCO and ICGA logos, and at the bottom right is the slogan 'Helping You Move Forward'.

Defeating Infiltration

Downers Grove, IL

112,000 lf 8-24" pipe
Mainline Joints-24,600
Lateral Connections-2,100
Manholes-440



Helping You Move Forward

NAASCO ICGA



This slide features a decorative blue water splash at the top. The main title is 'Downers Grove, IL'. Below it is a list of statistics: '112,000 lf 8-24" pipe', 'Mainline Joints-24,600', 'Lateral Connections-2,100', and 'Manholes-440'. Below the text is a photograph of workers in safety vests and hard hats at a site with a large truck and orange traffic cones. At the bottom left are the NAASCO and ICGA logos, and at the bottom right is the slogan 'Helping You Move Forward'.

Defeating Infiltration

Benefits Gained at DGSD

Reduced infiltration
21%

Invested \$3m to
save \$30m in
collection system
improvements





Helping You Move Forward

Defeating Infiltration

Miami-Dade

Reduction of flow-128 MGD



Helping You Move Forward

Defeating Infiltration

Miami-Dade

Cost Avoidance: \$1 = \$2.5





  **Helping You Move Forward**

Defeating Infiltration

Embrace from Engineers



  **Helping You Move Forward**



Defeating Infiltration

Standards for Chemical Grouting

ASTM International: ASTM F 2304-03


“Standard Practice for Rehabilitation of Sewers Using Chemical Grouting”, which describes the procedures for testing and sealing individual sewer pipe joints with appropriate chemical grouts using the packer method.

ASTM International: ASTM F 2454-05

“Standard Practice for Sealing Lateral Connections and lines from the mainline Sewer Systems by the Lateral Packer Method, Using Chemical Grouting”

ASTM International: ASTM F 2414-04

“Standard Practice for Sealing Sewer Manholes Using Chemical Grouting”



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Defeating Infiltration

Standard Specifications

NASSCO
Specification Guidelines for
Wastewater Collection Systems

www.nassco.org

ICGA
Infiltration Control Grouting
Association

www.sewergrouting.com



SUGGESTED STANDARD SPECIFICATION

FOR

**PRESSURE TESTING AND GROUTING OF SEWER
PIPE JOINTS, LATERALS AND LATERAL
CONNECTIONS USING THE PACKER METHOD
WITH SOLUTION GROUTS**

Version: 1.10
April 2012

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Longevity

Acrylamide Provides Lasting Help for United States Government

Beginning in 1987, federal and state regulatory agencies began monitoring the water management operations of the United States Oak Ridge National Laboratory (ORNL), as well as other Department of Energy (DOE) sites. At ORNL, two Department of Energy (DOE) sites were monitoring levels of radioactive and chemical contaminants and their migration pathways. Some initial monitoring during the early stages of the Remediation Project, 1987. They concluded that the DOE did not have adequate means for long-term containment of the waste materials. Therefore, a comprehensive study was undertaken to find a lasting method of reducing water contamination and radioactive production.

Q Pilot Program for Grouting Selection

Since the nature of the ground and surface water contamination was generally known, Oak Ridge engineers immediately began to explore grouting applications and soil stabilization methods to stop the migration and soil leachate permeability of the contaminated waste level boundary. Several chemical grout formulations were evaluated for their ability to seal the porous ground composition of hydraulic conductivity reduction and improve the hydraulic conductivity of the grout formation over adjuvant grouts which contained polyacrylamide (PAA), calcium silicate hydrate, and bentonite. None of the suspension grouts could effectively penetrate the soil formation and were therefore not applicable as candidates for further evaluation. The acrylamide grouts, consisting of suspended solids, suspended acrylamide, suspended formaldehyde, acrylate and acrylamide. Each demonstrated good permeability of the soil and reduction of the hydraulic conductivity. Only acrylamide/grout was able to reduce the hydraulic conductivity from 10⁻³ to less than 10⁻⁷ m/s. Grout reduction was achieved because the performance of the acrylamide grout exceeded the maximum permeability of the surrounding formation by a factor of 100. The acrylamide chemical grout was selected and patented in the next phase of testing.

Of the seven original grout formulations evaluated only acrylamide reduced the hydraulic conductivity levels below 10⁻⁷ m/s.

Q Pilot Program - Phase Two (cont.)

Over sections of grout treatment zones



Full-scale grouting of the buried radioactive waste that has taken place in the summer of 1988 and continued to the end of that year. A reduction in the quantity of radioactive waste leakage was immediately observed in adjacent monitoring wells, and it continued long-term after completion of the project. Plume migration from the site of the original project and grout treatment grout is still providing a safe barrier of the buried waste.

Q Field Application

Radioactive and hazardous waste encapsulation with acrylamide grout was approved by the DOE as a long-term solution.

Q Performance Summary

As the result of this project, the DOE required two final waste disposal applications to have performance identical to approximately 200 years for the isolation of hazardous radioactive waste disposal. Acrylamide grout was selected using these government standards and exceeded the parameters. As a result, acrylamide grout was approved by the DOE to manage the long-term isolation and storage of surface and subsurface waste.

Q Testimony

Spaulding, R. R., S. Y. Lee, C. G. Farnes, L. K. Hinkle, and R. Swartz, 1988. An On-Site Grouting of Radioactive Waste with Polyacrylamide. Oak Ridge National Laboratory, ORNL-4422-1005. Publication no. N4486-01. Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN 37831.

"The half-life for acrylamide chemical grout was 362 years."




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Engineers, Contractors, & Municipalities Agree

Grouting and lining are complimentary technologies vs competing alternatives






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Defeating Infiltration

Engineers, Contractors, & Municipalities Agree

Grout first to stop infiltration,
Line second for structural repair,
Do both when necessary.



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Defeating Infiltration

Engineers, Contractors, & Municipalities Agree


Defeating infiltration requires a
comprehensive approach at all
four points of entry



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Promise Documents




Infiltration Control Grouting Association
A Division of NASSCO, Inc.

WHITE PAPER

THE ROLE OF CHEMICAL GROUTING IN WASTEWATER SYSTEMS:
How to Reduce I&I and Prevent Structural Damage with Intelligent Use of Chemical Grout

Prepared by:
Angela W. Stacking, L.S.
www.2ndwatercontrol.com
May, 2011





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Thank you

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