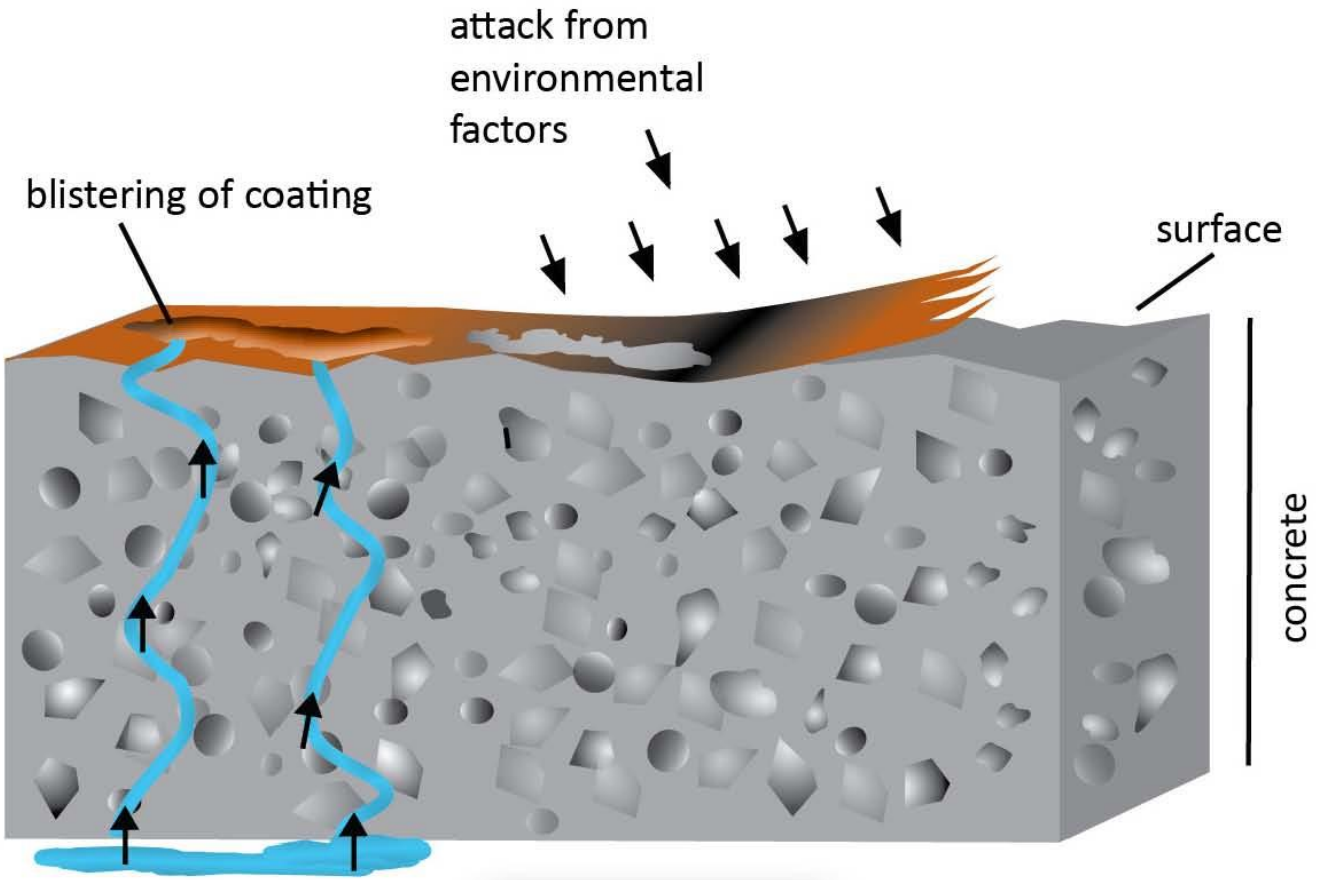
The Importance of Proper Inspection

Rocky Capehart

SPRAYROQ® Protective Lining Systems

LMK® TECHNOLOGIES

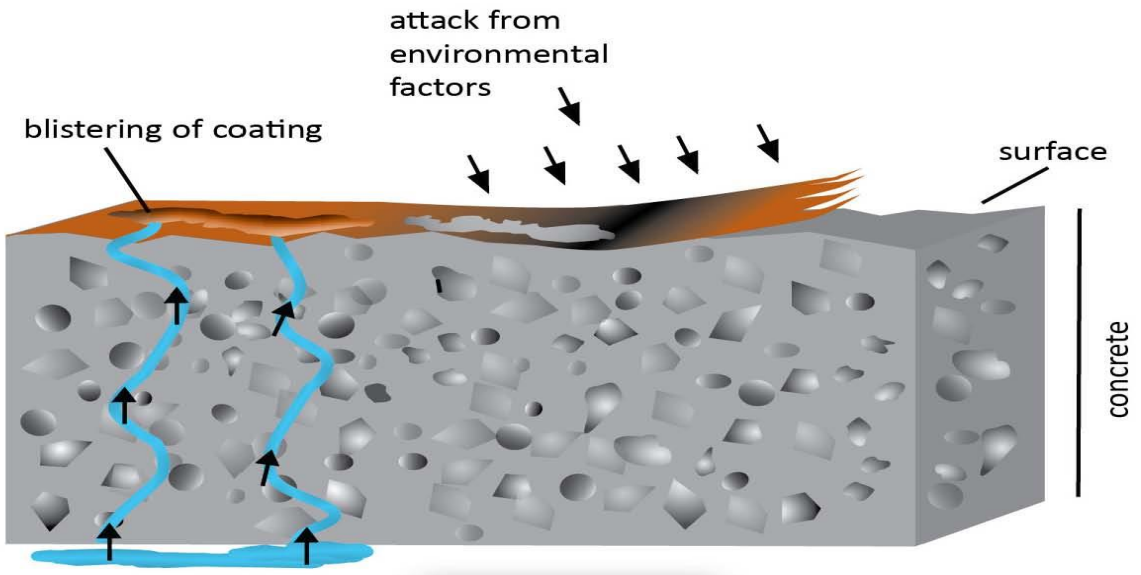
How Do We Help Prevent:



PROPER INSPECTION

All of the below should be performed as specified in the contract documents:

- **product specified is being used,**
- **specified surface preparation has been completed,**
- **product is applied as per manufacture's recommendation,**
- **AND Post application INSPECTION**



Manhole Preparation
Quality Assurance and Testing

- **Substrate surface preparation requirements**
  - **Hydroblasting, Sand blasting, Grinding**

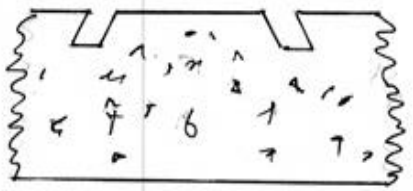
- **Inspection before material application**
  - **Clean, dry, sound, surface profile, pH Test**
  - **Equipment**

KEY FACTORS FOR PREP SUCCESS

Obtain a clean, dry and sound surface!

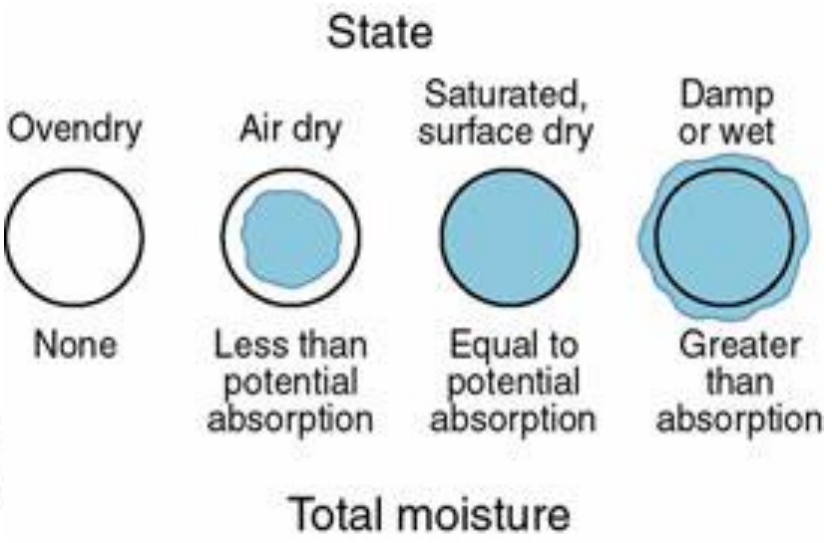
- **Understand repair procedures:**
  - **infiltration or substrate loss**
- **Understand preparation procedures**
- **Know how to test preparation results**
- **Know common methods of:**
  - **cleaning power**
  - **abrasive choices**
  - **coating removal**

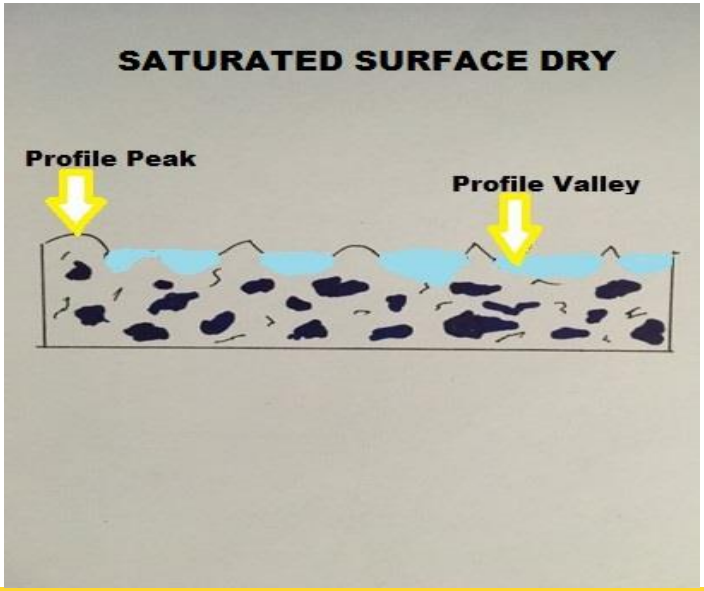
Coating termination keys



Moisture Level Definition

Saturated Surface Dry describes the condition of the aggregate in which the pores in each particle of the aggregate particle are filled with water and no excess water is on the particle surface. This allows the absorption and the specific gravity of the aggregate to be measured. Moisture content of aggregate is described by four categories:





pH Test

Complications with a product application may occur if pH levels (number designation) are:

- **too high (alkaline) or too low (acid).**

EQUIPMENT

- Equipment is product dependent
- Some can be mobilized into underground structures as necessary
- Material output is meeting proper ratio

Manhole Preparation
Quality Assurance and Testing

- Materials used during application
  - Infiltration Control, Resurfacing, Coating/Lining
- Testing after application
  - Visual
  - Holiday (Spark)
  - Adhesion
  - Coating Thickness

VISUAL INSPECTION

- Cracking, pinholes, exposed substrate
- Proper bench and invert rebuild
- Frame/chimney sealing
- Pipe joint seals
- Step removal or replacement

WRINKLES & SAGS

MONOLITHIC INSTALLATION

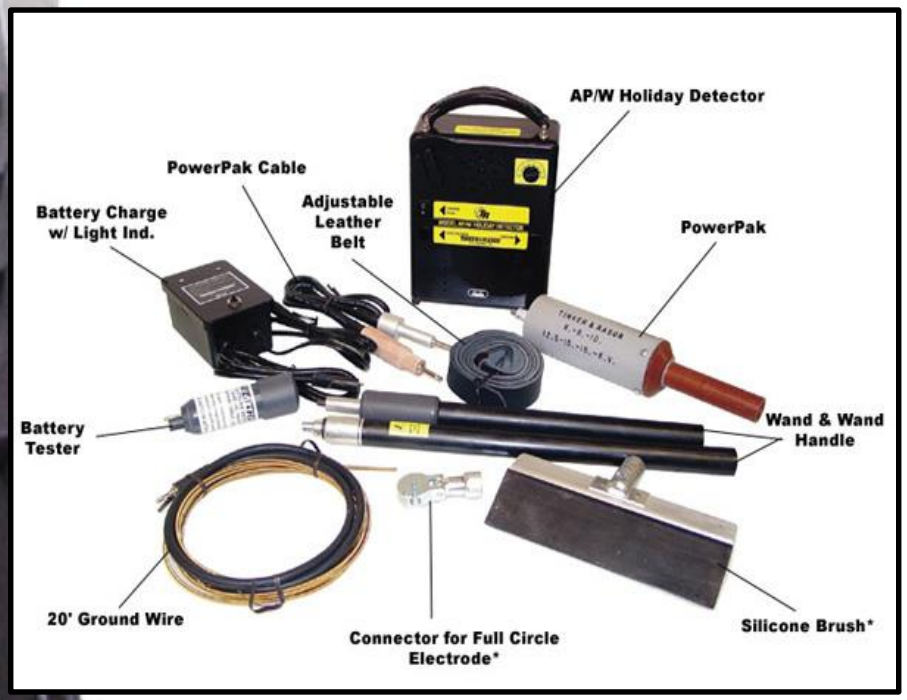
Holiday (Spark) Testing

A barrier without fault provides effective long-term elimination of infiltration and corrosion protection

Refer to NACE RPO188-Concrete & Steel

Refer to ASTM G627-87-Steel Pipe

HOLIDAY (SPARK) TESTING EQUIPMENT

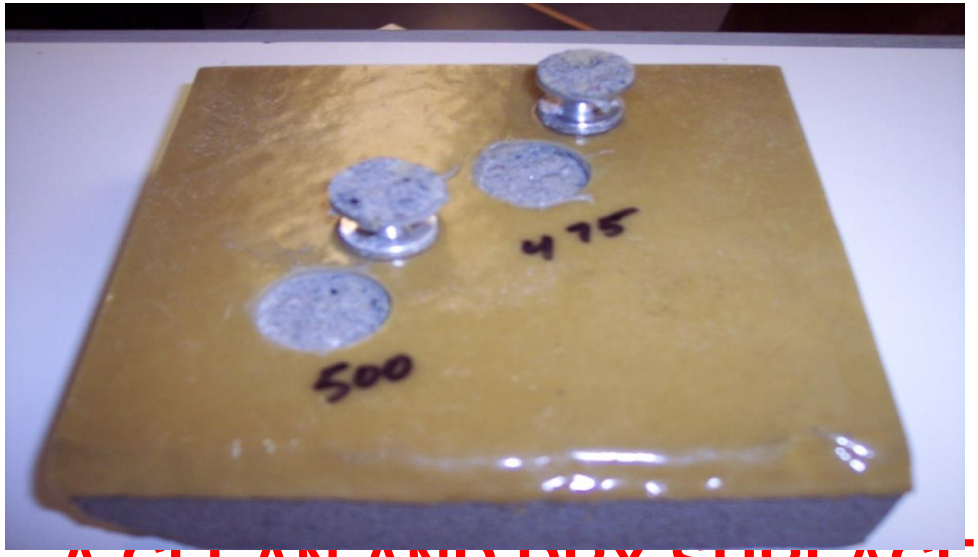


POLYMER COATINGS ADHESION

"A verifiably acceptable mechanical bond to the host structure is essential for long-term performance."

"USE TRAINED & EXPERIENCED COATING INSPECTORS"

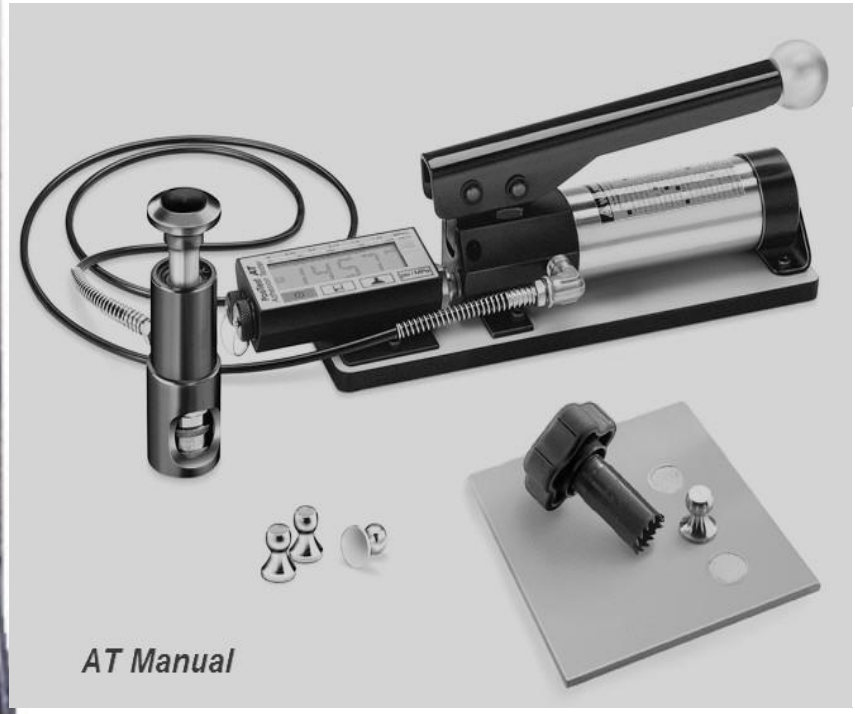
FOLLOW ASTM D7234-05 (Concrete) ASTM D4541-09 (Steel)



A CLEAN AND DRY SURFACE

WILL PROVIDE OPTIMAL RESULTS !

ADHESION (PULL) TESTING EQUIPMENT



ADHESION (PULL) TESTING

COATING THICKNESS

WFT
Wet Film Thickness
(Slow Setting Coatings)

DFT
Dry Film Thickness
(Fast Setting Coatings)

COATING THICKNESS GAGES

WFT
Wet Film Thickness
(Slow Setting Coatings)

Liner Disbonding

Liner Disbonding

Disbonding Failure Due To Poor Surface Prep

Delaminated Coating
Poor Surface Prep-Substrate

Inner Coating Delamination
Poor Adhesion- Material Not Applied Per Manufacturer's Recommendations

Lining Disbonding-Poor Prep and Hydrostatic Loading

Lining Disbonding-Poor Prep and Hydrostatic Loading

Sheet Lining Failures
Poor Welding and Pinholes

Substrate Deterioration
Due to Pinholes and Poor Welds

Pinholes and Thinner Coating Than Recommended by Manufacturer

Pinholes & Thin Coating

Pinholes-After 5 years of Service

Buckling Failure Due To Hydrostatic Loading/Poor Prep

Failure-Poor Prep
Coating The Frame is Not Recommended

Thinner Than Specified Coating Application

Thinner Than Specified Coating Application

Failure Due to Improper Application

Missing Lining Termination Keys
No Seal At Interface Between Lining & Substrate

Possible Equipment &Tool Damage Pinholes

COATING INSPECTION PARAMETERS

Substrate inspection - Ambient conditions - Surface profile - Surface cleanliness Mixing procedures - Application procedures

SAMPLE FORM

Quality Assurance/Quality Control-Fast Set Polymers

Contract Name: __*Manhole Rehabilitation* _____ Contract No: _____

Contractor/Installer: _____ Construction Observer/Inspector: _____

Report No._____ Weather:_____ Structure Temp: Ambient_____ Surface_____

Other Work in Progress:

					Inspection	
		Performance	Acceptable		Results	
No.	Quality Assurance	Standard	Quality	Quality Control	Pass/Fail	Comments
1	*Visual inspection of structure substrate after cleaning and preparation*	*Industry Standard*	*100%*	*Visually inspect surfaces to be coated for effective removal of existing coatings, unsound substrate, laitance, infiltration. Visually identify problem areas.*		
2	*Test substrate for soundness.*	*SSPC- SP 13 NACE No. 6*	*100%*	*Lightly scratch prepared concrete surfaces with a screwdriver or pocket knife. The scratch should leave a shiny mark with no loose particles from the surface. Otherwise, re-prep and re-inspect.*		
3	*Visual inspection of product application and documentation of proper material ratio/usage*	*Product Technical Data Sheet (ratio)*	*100%*	*Visually observe mixed color which should be homogenous without marbling effect. Inspection recordkeeping of applicator for material usage of product components, verify proper usage.*		
4	*Wet Film Thickness (WFT) measured during application. Note: Not applicable with fast setting polyurethanes-Use adhesion test dollies to measure mil thickness.*	*ASTM D-4414*	*No less than 90% or greater than 120%*	*Measure and record the WFT in at least four locations for every 500 sf and each coat of material applied.*		
5	*Holiday Detection using a high voltage holiday detector.*	*NACE RPO-188*	*100%*	*Confirm conductivity by inducing holiday and calibrating detector. Test entire coated surface. Repair and retest as required.*		
6	*Adhesion Testing on a minimum of 10% of the manholes or one test per 200 square feet on structures coated.*	*ASTM D7234 ASTM D-4541*	*As specified*	*Perform a minimum of three pull tests per manhole at locations randomly selected. Record dolly location, pull strength (psi), mode of failure and whether dolly was scored or unscored. Evaluate results and repair coating where tested.*		

Owners Representative: Name **Signature** **Date**

Contractor/Installer Representative: Name **Signature** **Date**

NASSCO

Inspector Training Certification Program
Manhole Rehabilitation
(ITCP MR)

- Course length – 1 ½ days
- Trainer makes a presentation that follows the manual
- General topics include
  - Manhole defects
  - MH prep & QA
  - MH rehabilitation & replacement technologies
  - Performance specifications
- Students must pass an open-book test

THANK YOU

Rocky Capehart

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