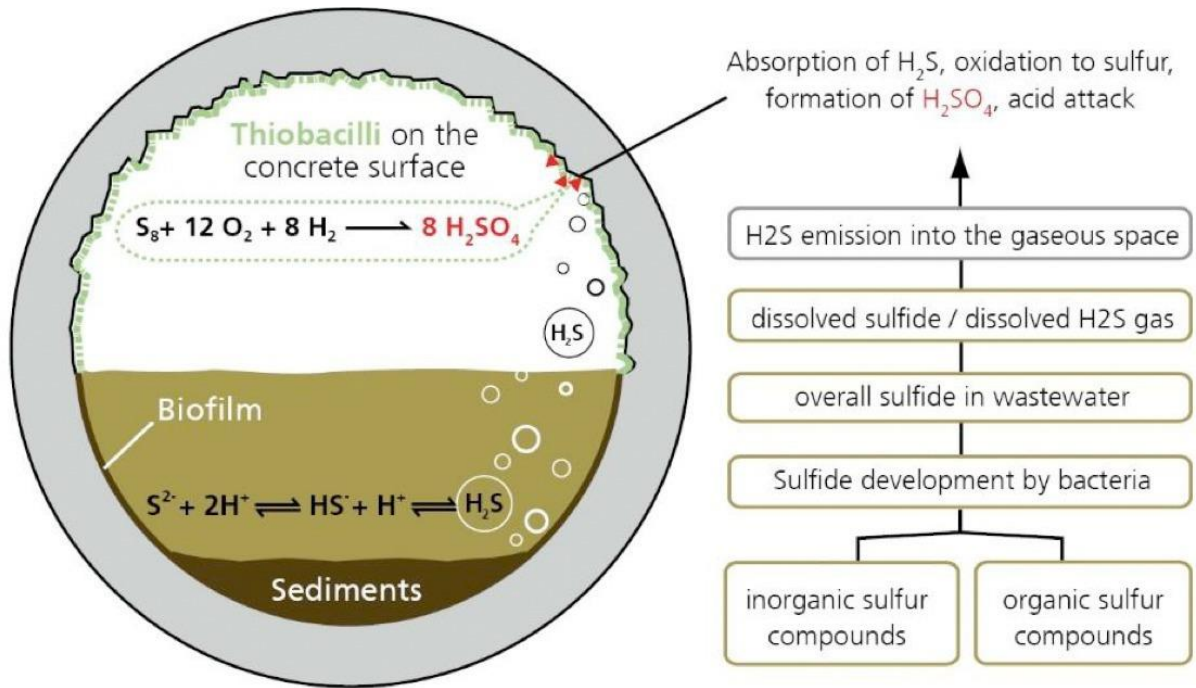




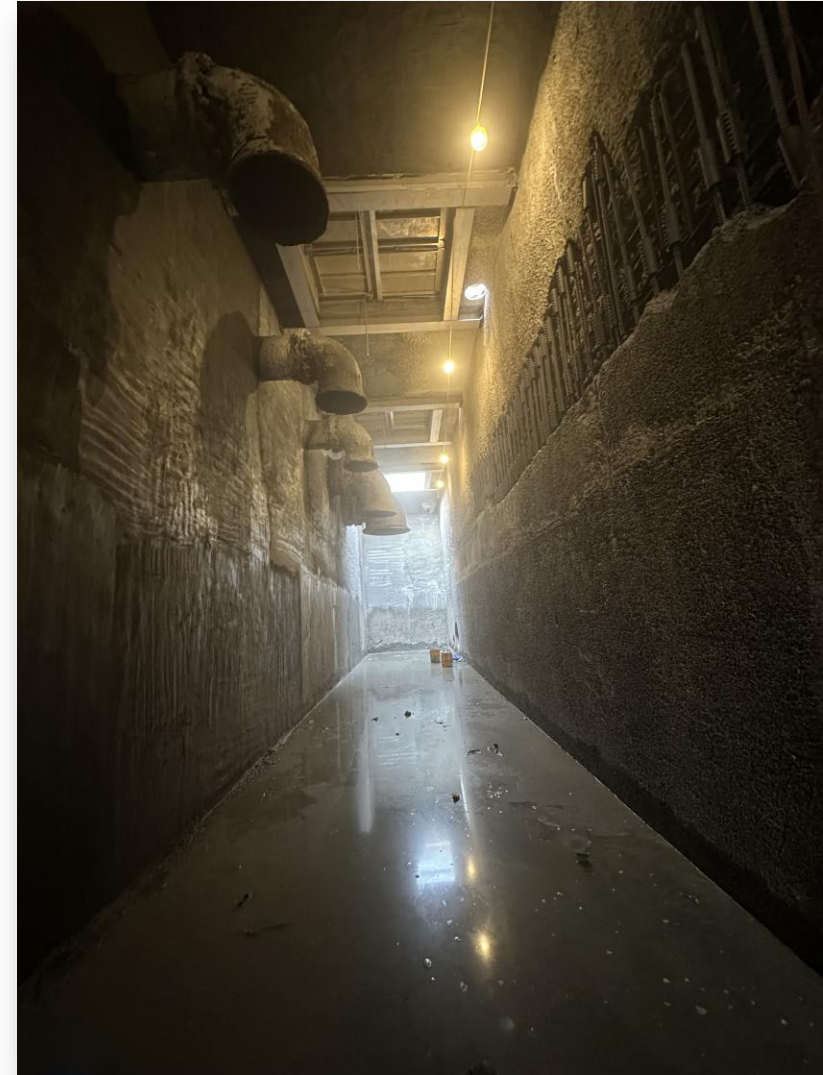
Concrete Protection in a W/WW Environment: A Full System Approach

Vapor Phase Corrosion



- Most all corrosion in the vapor phase (head space) or above the water line can be attributed to microbiologically influenced corrosion (MIC).
- MIC is caused when sulfur reducing microbes (SRB) consume sulfur compounds in sediment layer. Sulfur oxidizing microbes (SOB) then take-up the released hydrogen sulfide (H_2S) and available oxygen ($2O_2$) to create aqueous sulfuric acid (H_2SO_4). This sulfuric acid attacks metal and breaks down the concrete matrix.

Vapor Phase Corrosion: Examples



Surface Profile of Concrete

- › International Concrete Repair Institute (ICRI)
 - Technical Guidelines 310.2R
 - Discusses Concrete Surface Profile (CSP)
 - CSP visual comparator ranges from 1 to 10



pH Testing

New concrete pH is near or above 12. Carbonated concrete and concrete exposed to an acidic environment (biogenic corrosion or microbiologically influenced corrosion) is typically < 8 .



Non-carbonated concrete
 Gradual loss of the protective capacity of concrete
 Partially carbonated concrete
 Completely carbonated concrete

pH value:	5	6	7	8	9	10	11	12	13
RAINBOW-TEST	5	7	9	11	13				
Phenolphthalein Test	< 8.5				> 9.5				
Thymolphthalein Test	< 9.3					> 10.5			



Moisture: Saturated Surface Dry



SSD refers to the condition of a material when it has absorbed water to the point where its surface is wet but does not have any excess surface water. In other words, the material is fully saturated with water, but any excess water on the surface has been removed.

- No standing water on the surface
- Uniformly saturated
- Adequate absorption

Carboline Carbocrete® 4010

- Ordinary Portland Cement (OPC) Mortar
- Quick setting, fiber reinforced
- High early strength
- Low shrinkage and lower permeability
- Contains modifiers to enhance cure and performance capabilities
- NSF 61 compliant



Typical Uses & Applications



- New and existing concrete and brick collection, treatment and storage structures
- Application by hand or various mix/pump/spray methods
- 3,000 psi compressive strength at 24-hrs
- Recoat in 6 hours

Epoxies (general properties)

Advantages

- Good to excellent barrier protection
- Good to excellent chemical resistance
- Good to excellent solvent resistance
- Good to excellent water resistance
- Many high build formulations
- Typically high solids

Disadvantages

- 2-component (pot life)
- Amines
 - Corrosive
 - Can be irritants
- Chalk readily
- Change color
- Some can blush

ASTM G210 (S.W.A.T.)



- › Accelerated biogenic corrosion
- › Sewer environment gases and acids
 - 500 ppm H₂S
 - 10,000 ppm CO₂
 - 5,000 ppm Methane
 - 10% Sulfuric Acid
- › 30-days with intermittent immersion/vapor cycles at 150F
- › Final test includes adhesion, DFT, water absorption, Electrochemical impedance spectroscopy (E.I.S.)

Carboline Hydroplate[®] 6500



- › A high-strength, ultra-high build, flexible, 100% solids epoxy lining.
 - Ultra-high build (250 mils+ single coat)
 - Single-leg spray pump application
 - H₂S and biogenic corrosion resistance (S.W.A.T. tested)
 - Applicable to SSD concrete surfaces
 - Apply down to 30°F
 - Cure to service in 10 hours or less
 - AWWA C210 compliant

Quality Control: Color formulation

Part A



Part B



Mixed Coating



Quality Control: Application Spray Pressures

SPRAY PRESSURE

Hydroplate 6500 optimizes applicator comfort and control. Achieve 250 mils in a single pass with smaller pumps under pressure as low as 2,500 psi.

Competitor 1



**6,000
PSI**

Competitor 2



**5,500
PSI**

Hydroplate 6500



**2,500
PSI**



Questions?