



# Drinking Water Systems and Copper Corrosion

# Types of Copper Corrosion

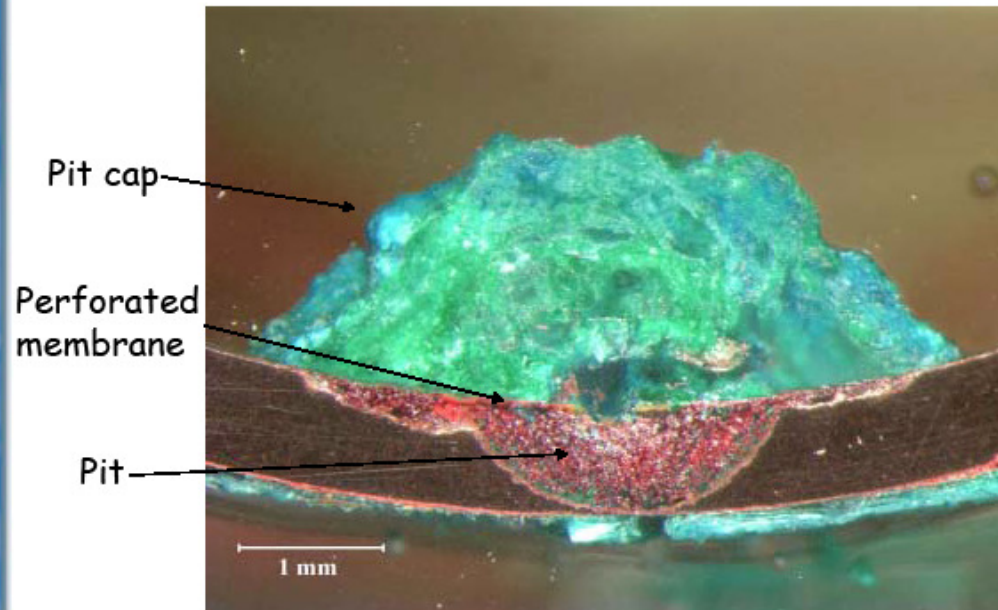
- Uniform Corrosion
  - Unacceptable (high) velocity in pipes
  - Water quality (neutral pH & high alkalinity)
  - Quality of material
  - Can result in elevated levels of copper in drinking water and at the wastewater treatment plant
  - Not the apparent issue in Oxford
- Non-uniform Corrosion (pinhole leaks or pitting)
  - Corrosion is localized over a small area (millimetres)

# Pitting

RESEARCH &  
DEVELOPMENT

*Building a  
scientific  
foundation  
for sound  
environmental  
decisions*

## Anatomy of a Copper Corrosion Pit



# Non-uniform Corrosion

- Cause is complex, often a combination of factors including water quality and/or physical
- Potential water quality factors include:
  - Hydrogen Sulphide
  - pH
  - Chlorine residual
  - Chlorides/Sulphates/Hardness

# Non-uniform Corrosion

- Potential physical factors include:
  - Poor quality pipe
  - Poor workmanship (insufficient flushing, poor quality flux)
  - Stagnation on new services/pipes
  - Excessive velocities
  - Electrolysis/electrical grounding
  - Use of softeners
  - Lack of metal watermains in the distribution system

## What Oxford has done:

- Not limited to Ingersoll – failures reported locally in London, Cambridge, Guelph, Woodstock, common issue in North America
- Tracking service lines failures in Oxford: Thamesford-3, Ingersoll-4, Mt. Elgin-3, Norwich-3, Tavistock-2, Embro-1
- Recent (post 2007) water treatment improvements have reduced the likelihood of pinhole leaks forming
  - Improved removal of H<sub>2</sub>S from approx. 50% to over 90%
  - Decreased pH by switching from aeration to oxidation by sodium hypochlorite
- Reviewed copper concentrations at WWTP – not elevated

## How to Protect Yourself

- Do not ground electrical service to your water line
- Do not use “pipe cleaning” type water softening salts
- Consider non-metal plumbing materials, or use thicker walled copper (avoid type ‘M’ copper)
- New homes: flush service line to remove high-chlorinated water

Questions?