# Copper vs Stainless Steel Tubes

Copper

- Clogging of Tubes due to oxidation and fast accumulation of solid deposits
- Copper should not be installed if the water has a PH of 6.5 or less. Private well water systems often have a PH below 6.5.
- Copper needs specialized labor – Brazing, Hot Weld Permit, etc
- Low strength and lower pressure ratings
- High Thermal conductivity
- Copper pipes connected to GI will cause galvanic corrosion
- Copper prices are more volatile

Stainless Steel

- By use of SS, this problem was eliminated
- Stainless Steel can be used in wide variety of applications
- SS press fittings can be installed by even unskilled plumbers.
- High Strength and high pressure rating upto 25kgf
- Low Thermal conductivity and hence low insulation
- Less volatility than Copper prices
- No such problems in SS pipes

http://www.alstromcorp.com/PR/PR02.pdf

# Corrosion Factors

- **THE pH OF THE WATER** In copper pipe systems when the pH is more than 8, a copper oxide film is usually formed on the pipe walls. When the pH in the water supply is lower than 8 in the water supply the copper oxide film (barrier) is dissolved leaving no protective barrier and the pipe is subject to the corrosive action of the water.
- **THE AMOUNT OF OXYGEN IN THE WATER** Dissolved Oxygen degrades metals through an electro-chemical process of internal oxidation. The result is that metal gradually gets converted to an oxide (rust), becoming thinner and weaker in the process. As the pipe corrodes the impurities are deposited in the water lines. Encrusted build up is the direct result of the oxidation process
- **DISSIMILAR METALS - GALVANIC CORROSION** The most frequent cases of this happening are when galvanized pipe and copper are connected; copper pipes touch steel studs, or steel pipe hangers.

http://www.hotel-online.com/News/PressReleases2000_1st/Jan00_TimeBomb.html

- **WATER TEMPERATURE** The higher the water temperature the faster the rate of oxidation. Experience shows that corrosion is more pronounced in hot water lines.
- **WATER VELOCITY** Erosion corrosion occurs at locations where water turbulence develops. Turbulence can be caused by excessive velocity, sudden changes in direction (sharp turns, elbows) and through “flow” obstacles such as burrs and solder excess. When the water velocities are above 4 ft/sec the copper oxide layer is destroyed or cannot form in the first place. Without this oxide layer the metal will tend to deteriorate at a more rapid rate.

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# Galvanic Corrosion – Brass vs MS

**<u>Galvanic Corrosion</u> - Another example of the higher corrosion activity usually existing at direct brass to black iron connections.**

**At low corrosion rates, galvanic corrosion may be negligible, but usually increases greatly once corrosion rates exceed 5 MPY.**

- **<u>Galvanic Corrosion</u> - An extremely common problem area due to the failure to install galvanic insulators between carbon steel pipe and either brass valves or copper pipe.**

  **Combined with schedule 40 pipe and a moderate corrosion rate, galvanic corrosion will often produce premature failures with 6-10 years.**

http://www.corrview.com/corr_06.htm

# Corrosion issues


- **<u>Pitting Corrosion</u> - The presence of one repair clamp and five nearby pinhole leaks confirms that a severe corrosion problem exists at this fire sprinkler piping location.**

  **This is made worse by the original installation of thin wall schedule 10 stock, where little wall thickness loss can be tolerated before reaching minimum acceptable limits.**

- **<u>Dezincification</u> - Typical surface deposit resulting from the dezincification of brass pipe due to old age and/or an aggressive water condition.**

  **Over many years, the zinc component of the metal is leached out to leave copper. Deep pitting is initiated and the pipe becomes porous prior to producing an actual leak, and leaving a corrosion product behind.**

http://www.corrview.com/corr_06.htm

# Galvanized Pipes

- **<u>Heavy Deposits</u> - A common corrosion result following decades of fire standpipe service.**

  **This galvanized steel pipe is barely recognizable as such, and accumulated an overall restriction of approximately 1 in. across this 6 in. diameter ID. Concern was raised once pinhole failures started at the threaded joints, with UT testing showing only 0.050 in. remaining in that area.**

- **<u>Galvanized Pipe</u>- Over 62 years of carrying New York City domestic cold water in this 8 in. galvanized wrought iron line produced this eventual result.**

  **UT testing showed deep under deposit pitting well throughout the pipe, and an overall corrosion rate of near 3.5 MPY. Corrosion produced both constricted smaller diameter pipe, and pinhole failures.**

http://www.corrview.com/corr_06.htm

**<u>CUI Corrosion</u> - Roof level pipe often suffers even higher exterior metal loss due to the combined effects of moisture condensation, direct water infiltration, and insulation damage.**

**Such heavy deterioration is usually only discovered after a leak occurs.**

**<u>Localized Pitting</u> - Partially water filled systems produce widely varying wall loss typically along the bottom.**

**For this dry fire sprinkler system, testing showed virtually new pipe after 25 years at the top, shown at the left. The wet pipe bottom however, shown at the right, was totally deteriorated to the point of failure.**

http://www.corrview.com/corr_06.htm