



Hanger Wires in Chlorine Environments

Investigation as a result of some local failures of suspended portland cement plaster ceilings several years ago spurred this suggestion.

It was discovered that hanger wires composed of stainless steel in closed plenum areas were unreliable when they were above wet areas where chlorine and high temperatures are present. Specifically these observations were intended for swimming pools, hot tubs, spas, steam rooms and other related environments. Chlorine is extremely electronegative and therefore very reactive with certain compounds and elements with stainless steel being one of them. This can lead to stress corrosion cracking and inevitably collapse or failure of suspended portland cement plaster ceilings.

The high chlorinated humidity of indoor swimming pools and hot tubs exacerbate the conditions where vapor can diffuse through the plaster and condensation can occur in plenum areas that are cooler than the air in the pool areas below. Newer methods of recirculating air in these environments can also increase the humidity levels, which in turn add to the build-up of contaminants in the atmosphere. These chlorine containing contaminants condense and dry on stainless steel hanger wires and rods in repeated cycles that add to their corrosive concentrations. This has resulted in stress corrosion cracking and failures in some installations. Further exacerbating the problem, these plenum areas are also generally not accessible for regular inspection, cleaning or maintenance.

While the Minnesota Lath and Plaster Bureau does not claim to be the authority on this subject, reliable sources at the time of this investigation recommended that hanger wires or rods used in these applications be composed of Monel Alloy 400 (UNSN04400). Monel 400 is a nickel/copper binary alloy of 63-70% nickel, with the balance copper. It is highly resistant to corrosion and acids. Further investigation into this matter has also revealed that a galvanic corrosion can also occur between Monel and zinc (galvanized lath) in a moist atmosphere. Ideally then, it is essential that adequate ventilation and temperature be maintained in plenum areas above these plaster assemblies to prevent the accumulation of moisture on hanger wires and/or rods. Failure to do so jeopardizes not only the support of the plaster system, but the lives and well being of the people that enjoy the pool facility.

Other Preventive Measures

- Ceiling design should be carefully considered before construction.
- Explicit instructions for maintaining and monitoring the chemical balance of the pool should be given to the owner upon taking occupancy.
- Bathing load limits (number of bathers) should not be exceeded to minimize the potential for organic contamination.
- Management of pool should include instructions for proper hygiene before entering the pool.
- Maintain proper air quality by regular maintenance and correct operation of HVAC systems.
- Maintain regular third party inspections of safety critical hangers and rods through access panels in the suspended plaster ceiling.