

**Additional information regarding Southern California Edison's analysis of scratches to  
Multipurpose Canisters (MPCs) during the downloading process  
Jan. 13, 2019 FINAL**

**Defining the Worst Case Scratch**

Normally, as the MPC is suspended vertically and slowly lowered between the clearances of the shield ring, there is very little sideways weight loading of the MPC wall as it contacts the cylindrical inner diameter of the shield ring. During some downloading operations the forces centering the MPC into the clearance may provide somewhat higher lateral loads due to realignment as the MPC cylinder passes the ring. However, all lateral contact of the MPC wall is against painted shield ring surfaces for which much research data was developed by SCE vendor Holtec that showed this special coating would protect the stainless steel from being scratched.

To calculate the worst case scratch, Holtec assumed an MPC weight about 14 percent above the maximum loaded SONGS MPC; maximized the angle that the MPC could be misaligned based on geometric modeling; and, the wall of the MPC was forced to maintain that angle and that load (about 2,400 lbs.) as it passed across the corner edge of the shield ring inner diameter. In actuality, the angle and load would lessen as the MPC realigned to pass by the shield ring. Still, to further maximize the test scratch, the protective paint layer was assumed to be absent. The result of the bare steel corner with a maximum possible angle and load was a scratch that was *0.010 inches deep* and *0.125 inches wide*. This is well within allowable limit for the [American Society of Mechanical Engineers](#) code for the 5/8 inch thick stainless steel canister walls of *0.0625 inches deep*.

To sum up, the worst case possible angle and load that could exist for the MPC against the edge of the shield ring was the one evaluated, including the absence of any protective paint coating. If a statistical set of cases would have been selected with very many calculations run with more likely lesser angles and loads against the edge of the shield ring, a much lower average scratch depth would be determined. Instead, only the worst case was assumed, since if that case was acceptable, all lesser cases for scratch depths would also be okay.

**The Protective Oxide Film**

At the end of the multipurpose canister manufacturing process, the outer diameter of the MPC is cleaned of any manufacturing debris and dried before the MPC is wrapped in protective covering for shipment. The stainless steel on the delivered component has a protective oxide film due to chromium oxide, which was formed in air before shipping. If a new scratch were to occur during downloading, in a non-corrosive environment like ambient air, and at the warmer temperatures seen for a loaded MPC, any scratching of the outer surface repairs itself very quickly.

What would it take to have corrosion develop around a fresh scratch? The scratch on the stainless steel material would need to be immediately exposed to a wet, corrosive environment *before* the film was reformed. In that case, the scratched area could corrode more than the unscratched area. However, no wet corrosive environment can occur inside a dry fuel storage module for many years after downloading due to the decay heat from the used fuel keeping the MPC surfaces dry in the recirculating ambient air.

To sum up, any incidental contact that occurs during the downloading of canisters is repaired through the self-healing of the protective oxide layer on the outside of the canister. (Note: SONGS canisters are manufactured out of 316L stainless steel, a highly corrosion-resistant form of steel often used in marine environments.)